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ABSTRACT

This document, a result of the October 1979 joint meeting of the World Health Organization and the United Nations Children's Emergency Fund (WHO/UNICEF) on Infant and Young Child Feeding, provides both a report of the themes discussed by the participating working groups, and a compendium of background information relevant to these themes. The five themes discussed by the working groups (presented in the first section of the document) deal with a variety of subjects considered basic to infant and young child feeding. These subjects include such issues as the encouragement and support of breastfeeding; the promotion and support of appropriate weaning practices and the related need for information, education, communication, and training; the health and social status of women in relation to infant feeding; and the appropriate marketing and distribution of breast-milk substitutes. The second section of the document (containing the compendium of background information) covers such material as the nutritional needs of infants; composition of human milk; factors influencing the volume of human milk; breastfeeding and child spacing; and lactation and contraception. This section also addresses two fundamental questions: to what extent and how long can breastfeeding meet the nutritional needs of the infant under different circumstances? (Author/MP)

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INFANT AND YOUNG CHILD FEEDING

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Introduction

Health is essential to the satisfaction of human needs and to an improved quality of life. The nations of the world have set the target of "the attainment by all citizens of the world by the year 2000 of a level of health that will permit them to lead a socially and economically productive life".

The first years of life are crucial in laying the foundation of good health. At this time certain specific biological and psychosocial needs must be met to ensure the survival and healthy development of the child and future adult. One of these vital needs is the nutrition of the mother and infant.

Malnutrition is today the most widespread and serious problem affecting young children; combined with infection it is the major cause of death of millions and it is responsible for the retarded growth and development of even greater numbers.

Malnutrition is more than a medical problem; it is related to the conditions of families and women; it has social, economic and political roots; and it is closely associated with poverty. Differences in health status of mothers and children within and between countries are among the most telling indicators of the socioeconomic disparities of today's world. Each year, about 17 million children under five years of age die, 16 1/2 million of them in developing countries. Global developmental efforts as well as specific national and international policies and programmes are urgently needed to deal effectively with this problem.

While bearing in mind the complex background to the problem of malnutrition, the meeting which was convened jointly by WHO and UNICEF and which took place in Geneva from 9 to 12 October 1979, was concerned with the promotion of the health of infants and young children through the maintenance of breastfeeding and the revival of its practice where it is declining, and with the introduction of suitable foods to supplement breast milk between the ages of four and six months.

Breastfeeding is ideally suited to the physiological and psychosocial needs of the infant everywhere. In adverse socioeconomic and environmental circumstances breastfeeding has considerable advantages over artificial feeding because of such factors as the possible use of contaminated water for mixing feeds, the lack of facilities for the proper preparation and storage of breastmilk substitutes, the high cost in relation to income leading to the overdilution of breast-milk substitutes, and lack of information about their proper use. On the basis of experience in traditional societies, it appears that very few mothers are unable to breastfeed for physiological reasons. In the world as a whole, however, large numbers of women do not breastfeed, or do so for a short period only, for various reasons inherent in their own upbringing and life-styles, for lack of information and misperceptions, incon- venience, the influence of advertising, and conditions of their work and employment.

In developing countries breastfeeding is still common, especially in rural areas. Nevertheless in many countries signs of a decline have been observed which, in the interests of infant and young child health, must be halted. The decline in breastfeeding in some industrialized countries now appears to be reversing and this too should be actively followed up and supported.

Breastfeeding usually meets the needs of the young infant up to the age of four to six months. From this age, however, depending on the growth of the individual baby, semi-solid and, later, solid foods must be introduced progressively while, at the same time, continuing breastfeeding for as long as possible. Specially prepared foods are needed in increasing quantity and variety until the child can eat the regular family diet, which occurs between 18 and 30 months of age depending on the nature of the family diet, and food habits in various cultures and parts of the world.

Malnutrition is more common during this transitional period than in the first four to six months, largely because families may not be aware of the special needs of the child, or may not know how to prepare weaning foods from the foods that are available locally, or they may be too poor. In many places traditional child-feeding habits that were reasonably satisfactory can no longer be followed for reasons such as urbanization, new patterns of family structure, higher prices of foods rich in nutrients, and changes in the pattern of women's work.

Some women cannot breastfeed. In these cases breast-milk substitutes must be used. These can be either industrially processed or prepared at home. While their use is sometimes essential, it has proved very difficult to avoid their excessive and sometimes improper use as breast-milk substitutes where substitution is neither necessary nor advisable. It is clear that the use of breast-milk substitutes should not be publicly promoted. Marketing practices have to be changed, and should be subject to national legislation or regulations or other measures as appropriate to the country concerned, be they manufacturing, exporting and/or importing countries. The public should be better informed about correct infant and young-child feeding practices. Families below certain income levels need help to ensure that the pregnant and lactating mother, and the young child, have access to the food they need. The maintenance of breastfeeding and the timely introduction of adequate complementary foods is a complex task that demands action by governments and many groups in society.

The deep concern felt by many people, organizations and governments about the state of health and nutrition of the infant and young child prompted WHO and UNICEF to call the October 1979 meeting referred to above. It was held as part of the two organizations' ongoing programmes on the promotion of breastfeeding and improvment of infant and young child nutrition.

The participants included representatives of governments, agencies of the United Nations system and technical, nongovernmental organizations, the infant food industry and experts in related disciplines. There were approximately 150 participants.

The meeting was conducted in plenary sessions and in five working groups. The themes discussed by the working groups constitute the first part of this document. The recommendations of the meeting are to be found on p. 54.*

Since the meeting many of the activities called for by the Recommendations have been undertaken. These were reported upon by the Director-General of the World Health Organization to the Thirty-third World Health Assembly of May 1980, which adopted resolution WHA33.32; a copy of this resolution is to be found on page 77.

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* see also: Joint WHO/UNICEF Meeting on Infant and Young Child Feeding, Geneva, 9-12 October 1979. Statement, Recommendations, List of Participants. Geneva. World Health Organization, 1979.

Among the many recommendations of the October meeting, one specifically mentioned that "there should be an international code of marketing of infant formula and other products used as breast-milk substitutes". WHO and UNICEF were requested "to organize the process for its preparation, with the involvement of all concerned parties, in order to reach a conclusion as soon as possible".

Early in 1980 WHO and UNICEF prepared a draft of such an international code and organized consultations with concerned parties. Following these consultations, a second draft was prepared and presented to the Thirty-third World Health Assembly in May 1980. This draft was also sent to all Member States and concerned parties for their comments and suggestions. A new draft was prepared for presentation to the Executive Board of the World World Organization in January 1981, and the Thirty-fourth World Health Assembly in May 1981.

The present document is based on the background paper which was prepared for the Joint WHO/UNICEF October 1979 Meeting. However, many things have happened since that meeting, some of which have given rise to changes in this document. It is still presented in two parts but the emphasis has been changed. The first part now consists of the five themes for discussion used at the Meeting which outline some important issues.

The second part of the document contains the background information pertinent to the subject of infant feeding practices. It is not meant to be a scientific treatise nor a comprehensive review. It was compiled with the assistance of leading experts in the various fields touched upon and is intended to stimulate further thought and discussion.

This document is being published in its present form by popular request because it was felt that it would be a useful input to national workshops and other activities for health and other workers aimed at the support and promotion of breastfeeding and improved infant feeding.

PART 1. THEMES FOR DISCUSSION

The five themes presented here deal with a number of issues and questions that are considered basic to infant and young child feeding. These are not exhaustive but rather are meant to stimulate discussion on what might be done in the framework of development programmes, and in the context of primary health care, to improve nutrition by attention to infant and young child feeding. They cover a variety of subjects, including the encouragement and support of breastfeeding, the promotion and support of appropriate weaning practices and the related need for information, education, communication and training, the health and social status of women and the appropriate marketing and distribution of breast-milk substitutes.

There are some intentional and unavoidable repetitions and overlapping of the different themes. Moreover, it is suggested that in the discussion of these themes reference be made to the various chapters of Part 2 of this document which contain relevant background information.

THEME 1
ENCOURAGING AND SUPPORTING BREASTFEEDING

Until recently breastfeeding was a prerequisite for the survival of the human species; there were few, if any, sound alternatives. Before the advent of industrially processed infant foods adapted to the specific nutritional needs of infants, almost all infants were breastfed, at least for the first months of life.

Breastfeeding as a learned practice

Breastfeeding, however, is not completely instinctive in the human. To a great extent it has to be learned; and for its successful continuation most breastfeeding mothers also need ecouragement and active support. What form this support takes depends on the nature of the mother's environment and her own needs.

Factors influencing breastfeeding

In communities where breastfeeding is usual, young women are often prepared for it through a gradual and continuing exposure to breastfeeding mothers. Under these circumstances it is taken for a natural practice and, as a rule, doubts about the ability to breastfeed and to satisfy the infant do not arise.

Moreover, in these circumstances, the nature of the family and social organization provide the mother with support and assistance during pregnancy, childbirth and lactation. This support may come in the form of other mothers who share responsibility for child care, or siblings and relatives who help with housework, and provide emotional support as well as physical help.

Neonatal practices

In traditional societies mothers assume a great deal of the care of the young infant immediately or soon after birth; breastfeeding is usually begun during the first hours of life, and, in the few instances when lactation or breastfeeding is difficult or impaired, there are alternative "mothering" mechanisms; wet-nursing by other lactating women, for example, is a common practice in many traditional societies.

Family influence

In industrial urban societies, family structure and functions are changing; the typical urban family tends to be small; different generations live apart, often at some distance from one another. In these conditions adolescent girls and young mothers have little opportunity to observe and learn informally about mothering practices from older female relatives. Few effective alternatives have emerged. Some women's groups and organizations have been formed in an attempt to fill this void but they reach relatively few; neither do the mass media nor conventional educational systems fill the gap.

Work patterns

In modern settings, moreover, conditions of life and work often do not favour breastfeeding; this is especially true of places where many women are engaged in industrial work far away from home. Rigid working hours, long periods away from the home and their day-to-day activities in general, reduce the time that women could otherwise devote to infant care and breastfeeding. With increasing urbanization, more women find themselves in these conditions, and as a result traditional mothering and child-rearing practices are changing.

For many mothers, the economic realities of life, among other factors, do not permit an easy choice between work outside the home and traditional child-rearing; physical separation from the infant for long hours has, for many mothers, become a fact of life. These are the mothers that have the greatest need for social support systems.

Health care practices

Many of the practices of maternity wards and hospitals have also contributed to the decline in breastfeeding by limiting the possibility of its early initiation, as well as "feeding on demand" and close contact between the mother and the infant during the first days. The attitudes and practices of the health staff, too, have an important bearing on whether a woman breastfeeds. Similarly the structure of the maternity ward itself may determine whether close continued contact between mother and infant is possible. Feeding schedules, for example, may be set to suit hospital staff routines rather than the needs of the mother and infant, and in some cases mothers may be led to believe that medical and other health staff consider formulas to be as good as, if not better than, breast milk. The abuse of anaesthesia, medication or surgery during delivery can also interfere with the initiation of lactation and breastfeeding.

Infant food industry and marketing

Another factor is the infant food industry. While it has met certain needs it has also diffused new and inappropriate ideas on infant feeding and has often created an unnecessary demand. The advertising and promotion of breast-milk substitutes, particularly in health facilities, may have contributed to the decline in breastfeding. Promotion of breast-milk substitutes by commercial concerns has been more extensive and pervasive than the provision of information about the advantages of breast-milk and breastfeeding.

Current trends

There are thus many factors that affect a mother's ability, opportunity or desire to begin and continue breastfeeding. As described in part 2, it is now known that in some parts of the world where the need for breastfeeding is crucial, many mothers in the poorer quarters of cities are either not breastfeeding their infants at all or weaning them after a few weeks. Similar, though less marked, trends are appearing in some rural areas.

Without strong intervention to promote and support breastfeeding, these trends are likely to continue. Even more infants and young children will be placed at risk of infections, malnutrition and death.

The women and families who are most in need of encouragement and support for breastfeeding have little access to the information, advice and measures they need. How can breastfeeding be best promoted and how can these women and their families be given the information and support they need?

Promotion of breastfeeding within health care systems

Because of their close link with families during the period of childbearing and child-rearing, health workers can strongly influence infant feeding practices. In many places, however, health workers do not reach those most in need. Health services are often concentrated in urban areas, with "top-down" programming, too much specialization of health staff, and inadequate training in education and communication skills; this has limited their effectiveness. The reorientation of health care systems based on primary health care is now generally recognized as the key to overcoming such problems.

Primary health care

Primary health care is a challenging way of making essential health care available to all. Education about health problems and how to prevent them, maternal and child health care, family planning, control of infections, and measures to ensure enough nutritious food are essential and closely interrelated elements of primary health care; they are especially pertinent to infant and young child feeding. Primary health care emphasizes family-oriented care and support, and community self-reliance in health matters.

Role of other sectors

Primary health care workers concerned with maternal and child health, including traditional birth attendants, have an important role in supporting the mother by teaching her about nutrition and infant feeding. Nutrition education should be part of the health care of the family. Extension workers from all sectors, who are in contact with youth and mothers, also have an important role in the promotion of breastfeeding. But, generally, as in the case of health workers, their training and supervision will need to be reoriented and reorganized.

The promotion of breastfeeding should form part of national education as well as national food and nutrition policies and programmes; it should not be considered or presented in isolation.

In efforts to promote breastfeeding, birth spacing should be emphasized. Adequate intervals between pregnancies have a bearing on the maintenance of the mother's health and continued breastfeeding. It is equally important that parents be fully informed about the role breastfeeding, particularly full breastfeeding, can play in preventing a new pregnancy. Information should be given about family planning methods that do not affect the quality or quantity of breast milk. Mass media could often be better used to provide this type of information.

Maternity practices

Given the importance of the early establishment of breastfeeding and its facilitation by bodily contact between the mother and baby immediately after birth, hospital and maternity routines in general should be more expressly designed to facilitate this contact. The physiological process of bondings has been shown to benefit from and, at the same time, to promote, successful and longer lasting breastfeeding. Similarly, feeding on demand should be preferred to a rigid feeding schedule. Much more thought will therefore need to be given to the organization of maternity wards and staff schedules so that feeding on demand can be accomodated and close continued mother-infant contact promoted. In some cultures it may also be necessary to try to provide some privacy for the mother and her infant so that breastfeeding can be established with the least difficulty. When infants have to be hospitalized during the early months of life all efforts should be made to ensure the successful continuation of breastfeeding; these would include flexible visiting hours in hospitals and accommodation for the mother when necessary.

Nutritional needs of the mother

During pregnancy and lactation the mother has additional nutritional needs for her own and her baby's health. Often, however, women are unable to get enough of the right food and are not well informed about their nutritional needs. One of the responsibilities of the health sector, as well as other sectors, will be to reinforce the efforts of the family and the community in improving this situation.

Education is an important means of doing so, but also employers must be more sensitive to the problem, and more support is needed from governments.

Social support

The types of support needed for the successful promotion of breastfeeding must vary from one society to another according to sociocultural, political and economic conditions. On the whole, however, informal community support systems and social legislation and policies can be effectively used to promote and support breastfeeding.

Social legislation

Concern about job security has been identified as a reason for failing to begin breastfeeding or to discontinue it too soon. Where job tenure is not assured mothers are often reluctant to take leave from work after the birth of their baby, far less to take extended leave. For mothers in organized employment, legislation on maternity leave as a means of facilitating successful breastfeeding therefore needs to be given high priority. At present the proportion of women who benefit from maternity legislation varies considerably both between and within countries.

Measures also need to be introduced to ensure that mothers on extended maternity leave appreciate its importance for the health and development of the infant and use it to this end.

The economic implications of broader coverage of maternity leave will require review as well as the different approaches to financing it. Similarly, the types of family allowances called for in different socioeconomic conditions will need to be examined.

Crèches and day-care

An alternative is to provide crèches or day-care nurseries in, or close to, factories and other places where women work so as to facilitate unhurried and emotionally satisfying breastfeeding and encourage its continuation. What approaches should be taken to promote these mechanisms and how they can be adequately financed and organized are questions that should be examined by governments, employers and communities.

Economic aspects of breastfeeding

The steps outlined above presuppose that policy-makers concerned with economic and social development will themselves be aware of the health and economic advantages of appropriate infant nutrition and breastfeeding. Infant health and the outcome of childhood can determine a country's potential for socioeconomic development. Ill-health in childhood is a drain on the national economy. Breastfeeding contributes to health and development. Even taking into account the cost of the extra food needed by lactating mothers, the relative economic value of breast milk is high as compared to the cost of industrially processed substitutes. Studies have shown that in some countries mothers who do not breastfeed need to spend as much as 75% of their basic wage to buy enough commercial formula to meet their infants' needs. Inevitably, expenditures such as these have repercussions on other family members and their food intake. Policy-makers should be more aware, therefore, of the implications of a decline in breastfeeding for family and national economies.

Comprehensive support to breastfeeding

Social actions designed to promote breastfeeding are unlikely to be effective without a general social awareness of the relation between breastfeeding, child health and general social development. Infant care and nutrition are joint responsibilities of family and society. Health workers can make a valuable contribution but the specific roles of obstetricians, paediatricians, midwives, nurses and other health workers will need to be better defined and promoted to this end. The contribution of other sectors will also be important, and needs to be defined in both the community and the government. Community organizations, women's groups, nongovernmental organizations and religious bodies will also need to support and promote suitable social measures. By ensuring that the general public is aware of the value and advantages of breastfeeding, they can also participate in facilitating and enforcing these measures.

Those that cannot breastfeed

Despite the well-known advantages of breastfeeding, and the efforts made to encourage and support it, there will always be some mothers who cannot or do not wish to breastfeed; there will be others who breastfeed only partially or for a short time. This is particularly so in urban communities and industrialized societies. These mothers need to be informed about the correct use of breast-milk substitutes and feeding techniques. Health workers particularly, but also workers in other sectors, must therefore be trained to provide the information and support needed by these mothers, while pursuing their efforts to promote breastfeeding generally.

THEME 2
PROMOTION AND SUPPORT OF APPROPRIATE WEANING PRACTICES

Under normal circumstances breast milk provides all the energy and nutrients needed by the infant for the first four to six months of life. Afterwards additional food must be introduced so that the infant gradually and progressively adapts to an adult diet. This adaptation constitutes weaning.

Needs of infants and young children

In relation to their size and body weight infants and young children have much greater nutritional needs than do older children and adults, but they have limited gastric capacity and their ability to chew develops only gradually. Weaning is therefore a critical process. This is particularly so where the adult diet is based on cereals or starchy roots with little or no foods of animal origin. On such diets, typical of most tropical and subtropical areas, the nutritional needs of older children and adults can usually be met if they eat enough of those foods. During or immediately after weaning, however, infants may be unable to eat enough of such bulky foods for their nutritional needs, especially if breastfeeding is discontinued early.

Home and community prepared weaning foods

Observation of weaning practices in traditional societies as well as new scientific knowledge indicates that it is generally feasible to meet the nutritional needs of older infants and young children with proper combinations of foods regularly taken by older children and adults. This is true even where milk and milk products or other foods of animal origin are unavailable, culturally unacceptable or too expensive.

Adult diet

Ingredients of diets

As a rule, adult diets based on cereals are complemented with legumes; those based on starchy roots or fruits are often complemented with fish or other animal foods when available. In this way adequate protein-energy ratios are achieved. The addition of vegetables and fruits to such diets provides the needed vitamins and minerals. Almost everywhere children can be properly weaned with these foods. In some cases fats need to be added. Advice may be needed about the proportions of the ingredients, how to prepare and give the food, and the frequency of feeding. Breastfeeding should be maintained as long as possible because of the nutritional value of breast milk in even small amounts.

A large number of recipes for home-made weaning foods have been designed and tested, combining foods regularly available and acceptable in different parts of the world, but more efforts have to be made to ensure their wide acceptability and use.

In addition to the nutritional value of different foods, however, other factors have to be considered such as cost of ingredients, time, fuel and utensils for their preparation, and storage conditions. Preparing weaning foods at the village level as a community effort with suitable technology may promote the best use of local foods and there have already been some encouraging experiences in this direction.

Changes in traditional practices

Often traditional practices which were generally sound have been modified by the influence of foreign cultures, economic factors, or a combination of both. In many places where pulses were an important part of the traditional diet, but where there has been a switch to cash crops, pulses have become scarce and expensive. As a result the diet of the poor has deteriorated. Infants and young children during and immediately after weaning are particularly vulnerable and under these conditions are likely to suffer most.

Weaning with local foods is socioculturally more acceptable, and has economic advantages for families, communties and countries since it eliminates the need to import expensive weaning foods. Governments should take the necessary measures to ensure that products needed for the home, and community prepared weaning foods, are readily available at an acceptable cost; their local production should be encouraged and supported. It may be necessary to consider the need for and possibility of subsidizing such products. Where milk and milk products are available they can be conveniently used as supplementary foods during the weaning period, but they are not indispensable. When the infant is already eating semi-solid foods breast-milk substitutes are not needed during weaning, .

Industrially prepared weaning foods

The use of industrially prepared weaning foods is generally a convenience rather than a necessity, but in certain circumstances they may be necessary, particularly in cities and towns and for full-time working mothers without family help.

Where the ingredients for home preparation of weaning foods are not available, efforts should be made in the first place to increase their local production or their availability. Sometimes this is not possible economically, and then industrially processed weaning foods, or the components of a weaning diet, must be made available on the market. In particular, animal milk, which it is desirable to include in the weaning diet, when breastfeeding ceases prematurely, often has to be supplied in an industrially processed form in many tropical areas.

Cost

From the point of view of relieving malnutrition, the cost of industrially produced products can be a serious handicap. To supply foods at a lower cost than imports, and make use of national resources, local manufacture of cheap, nutritionally adequate, weaning foods has been started in a number of countries. During the past 20 years, more than 80 such products have been developed and tested. Some have been manufactured and distributed commercially or through food distribution programmes, as, for example, in Algeria, Central America. Colombia, Egypt, Ethiopia, India and Turkey.

The cost of industrial processing, packaging, transport and commercial distribution makes the retail price several times higher than the cost of a home-prepared mixture.[1] Depending on the stage of development of the country and the socioeconomic goals of the government, the price of locally made weaning foods may need to be subsidized temporarily for all or some families. This should be done in the context of long-term national food and nutrition policies.

Misuse of weaning foods

Apart from cost, there may also be problems relating to the misuse of weaning foods. Foods intended as supplements have in some areas been widely used as complete baby-foods, and have created serious problems of malnutrition; this has been the case, for instance, with starchy flours. Labelling and advertising of these foods should be clear as to their proper use, and indicate that they are not, and should not be used as, complete baby-foods.

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[1] Exceptionally, some ingredients are cheaper than foods on the market, e.g., cotton-seed flour. Donated imported foods may be used as ingredients, but cannot be depended on as a permanent supply, nor lead to the development of self-reliance.

Industrially processed milks too are often wrongly used as breast-milk substitutes without the necessary modification. It is, for instance, extremely difficult to correctly modify sweetened condensed milk. To reduce the danger of their use, such products must be packaged so as to appear quite different from breast-milk substitutes. Labels should state that the products are not for use as breast-milk substitutes; in order to avoid their promotion as such, or any confusion by the purchaser, labels should not include any instructions on how such products can be modified for use as breast-milk substitutes.

Health and socioeconomic impact assessment

In general, before introducing industrially processed weaning foods into any market and before any product is sold or distributed in a country, or to a particular population group, its public health effects and socioeconomic impact must be assessed; benefits as well as possible dangers have to be identified and assessed.

It is not enough to claim that the marketing of a product provides consumers with an additional choice or an alternative to established practices and available products. The concept of legitimate markets and health and socioeconomic impact assessment is a tool that national administrators and planners should use in assessing whether a particular product serves the interests of families, the community or the country.

Food distribution programmes

Because infants and young children are particularly at risk of serious malnutrition, they are usually given priority in food distribution programmes. In emergencies and crises such programmes may be justified on both biological and humanitarian grounds. The use of food distribution programmes to prevent malnutrition in normal conditions, however, calls for careful review of its short-term effects; these may be quite contradictory. A number of issues should be considered.

Disadvantages

Dehydrated milk is a product that is commonly distributed to infants in supplementary feeding programmes, or as a social service. That misuse may contribute to a decline in the prevalence and duration of breastfeeding must be taken into account, and measures should be taken to prevent this. The infants to whom supplementary feeding programmes are directed are sometimes those for whom breastfeeding would be most valuable.

When milk is obtained through food aid programmes and introduced into areas where it is not commonly available, an undesirable dependence may be created; this applies also to industrially produced weaning foods obtained through food aid. Again steps must be taken to prevent this dependence.

Other approaches

The possibility should always be considered of supplementing the diet of pregnant and lactating women and, thus, through them, the infants; a variety of foods other than milk can be used to this end. Another possibility is to combine food aid supplies with local ingredients to prepare weaning foods for infants. In some cases where this has been tried it has stimulated the initial production of commercial weaning foods, reducing their cost and creating a demand for locally grown foods which, in turn, can replace the need for imported foods.

Assistance to families in need

The most important consideration is that there are families below a certain income level who need help to obtain their food, particularly the extra food needed for pregnant and lactating mothers, and for children being weaned. Food distribution, distribution of coupons (food stamps), cheap food ration shops, subsidized weaning foods, and family allowances are among the measures used for this purpose. However, most developing countries, because of organizational difficulties and expense, have not yet been able to make foods available on the scale required.

THEME 3
INFORMATION, EDUCATION, COMMUNICATION AND TRAINING

Except where breastfeeding is the regular practice and is not threatened, the public at large must be made aware of the fact that breastfeeding is ideally suited to the needs of young infants. Its economic advantages, as well as its nutritional, immunological, psychosocial and general health benefits for the infant and mother, should be made clear. It is also important that the public appreciate the implications and risks of artificial feeding for the health and development of infants and young children.

Sources of information

Infant and young child feeding practices are essentially learned and can be influenced by changes in life-style and social pressures. How and to what degree practices are adopted depends on the information available about them, the sources of the information, and the degree to which mothers regard the proposed practices as appropriate to their everyday lives.

As indicated in part 2 of this paper and elsewhere in part 1, breastfeeding has historically ensured the survival of the human species and has traditionally been facilitated by local informal social networks that provided example and support.

Nowadays, mass communications and rapid transport have facilitated the easy exchange of ideas, beliefs and experiences between societies. As a result ways of feeding infants have tended to change and practices that had been adopted by industrialized societies have been widely diffused and taken up in developing societies where they are neither suitable nor safe.

Feeding with breast-milk substitutes and the concomitant decline in breastfeeding is an example of this. Thus despite the advantages of breastfeeding, its popularity has declined in many places only to be replaced by infant feeding practices that are not as effective as breastfeeding and which when incorrectly used are harmful.

It is important that this trend be halted and the present level of breastfeeding be increased. Similarly, proper and timely weaning must be promoted. This cannot be done unless the public at large is made more aware of the crucial importance of breastfeeding and sound weaning practices. The educational messages designed to this end must be consistent and disseminated by all sectors.

Audience groups

A number of key audience groups can be identified. The family, as the unit most intimately concerned in supporting breastfeeding and appropriate and timely weaning practices, is of primary importance. Workers in health and other sectors such as education, social welfare and labour, also play a vital role in providing information and supporting social and health actions. But for any coherent programme in infant and young child feeding to be developed and sustained, policy-makers too must appreciate the nature of the problem and what needs to be done. In turn, an understanding of the problem by the community in general will facilitate the support of social policies designed to promote breastfeeding and appropriate infant feeding practices.

The information provided to various groups may possibly differ in level and type of approach, but it must be consistent. National and regional organizations may establish guidelines and design educational packages that can be used to prepare information for these different groups.

The family

Consideration needs to be given to the changing nature of the family and how this affects infant and young child feeding. In particular, attention must be paid to how children and adolescents can be prepared for parenthood, sensitized to the need for appropriate feeding habits, and educated in order to adapt their adult role of support to breastfeeding.

Channels of communication for children

Often, it may be possible to build on existing informal channels, especially traditional methods of education. However, sometimes it will be necessary also to look into the potential of schools and formal educational systems for educating people on infant feeding and helping to develop an understanding of the health and nutritional needs of the infant and young child.

Support to the family

Families should be aware of the resources that exist around them and upon which they can draw for support. Social security programmes, maternity allowances, women's groups and nongovernmental organizations are some of the resources that can play a vital role in helping the family. Often, however, the families who are most in need are unaware of the resources that are available and how they can use them. Effective ways of informing families about these resources must be sought.

Role of health workers

Health workers have traditionally influenced infant and young child feeding practices and in some ways have contributed to the changes that have taken place in infant feeding including breastfeeding patterns. Now their role in educating and guiding the public and policy-makers with respect to proper feeding practices must be strengthened. They must play an important part in determining national food and nutrition policies and in developing the support systems needed by women and their families. The roles of health workers including the health professionals as opinion leaders and coordinators of other sector activities relating to infant feeding need to be strengthened, so that they may function more effectively in bringing together governmental, nongovernmental and other agencies for the promotion of better infant and young child feeding.

With a few recent exceptions, the subject of breastfeeding has been neglected in the training of health workers at all levels, and in general they have been ill prepared to advise mothers and the public on the subject. This situation needs to be improved and changes made in the curricula of training institutions, especially in medical, nursing and nutrition programmes. Various aspects of this issue - health, nutritional, psychological, demographic, economic - must be emphasized and incorporated into training courses.

In general the role of the health worker in maternal and child health and nutrition should be reviewed and strengthened. In doing so, the value of the primary health care approach must be emphasized and the function of training institutions in preparing health workers for primary health care reinforced. The training of health workers should enable them to see themselves as an integral part of the community and not as specialized technicians separate from the social problems of the family and community. Health workers should not work in isolation and must relate to colleagues in other sectors such as education, social welfare, communications, legislation, management, agriculture and industry.

The health and other sectors

Education systems can play an important part in improving health. For example, teachers of children of all ages can promote the introduction of infant and young child care into curricula. Their influential position in many communities, moreover, as both leaders and agents of change, must be effectively utilized to this end. It may often be possible also to encourage educators to play a more active role in helping to determine what types of information are provided to the public through the mass media, and how the mass media can be used as a channel for health and nutrition information.

In general it is the mass media that have developed the most effective means of reaching large audiences. They should be more actively committed to the social responsibility of informing the public about, and promoting, specific infant and young child feeding practices.

In many parts of the world, agricultural extension workers and extension workers from other sectors constitute an important source of community leadership and information. Because the information they carry is often viewed by communities as important to their everyday life and work, these workers are usually very well accepted, and their messages readily incorporated into the community development process. Extension workers should, therefore, be encouraged to work closely with educators and the health team in promoting better infant and young child feeding. Similarly, workers in social welfare should take part in this work; their awareness of the social problems faced by families places them well to advocate and help to develop realistic policies and programmes in this area of nutrition. The part that all can play as educators, advisers and monitors of infant feeding practices should not be overlooked.

The community

Support for breastfeeding and the proper feeding of young children, however, must come from the community at large. Progress will be slow unless the community is aware of the importance of this problem and sensitized to the ways that community services can help families and complement the work of educators, health workers and workers in other sectors. How the community should be informed will vary with patterns of social organization and levels of socioeconomic development. Different entry points must be sought and utilized to promote good infant and young child feeding practices and conditions and services to meet the needs of mothers and infants in general. Communities are made up of different groups with different interests and needs; these differences should be recognized and messages adapted to the characteristics and needs of the different groups.

Policy makers

Whether any type of health or social action is implemented and sustained depends also in great part on the decisions and interest of policy-makers. Policy-makers have often been as poorly informed as the public at large about the importance of infant and young child feeding and the problems associated with it and have generally been unaware of the important part they could play in dealing with those problems.

Policy-makers from different sectors such as health, industry, education, social welfare, food and agriculture should all be made more sensitive to this question and be encouraged to see the interrelatedness of their work in solving the problems of infant and young child nutrition.

The information they require will again vary according to the sectors they represent, but as with all educational messages on this theme a basic common core of information must be provided to all policy-makers.

Communication channels

Programmes to communicate information can be effective only if they are planned to take into consideration the characteristics of those to whom the information is addressed. Specific research and studies may be required for this purpose to ascertain food consumption patterns, consumer and purchasing behaviour, and food beliefs and habits. The attitudes and practices of different target groups must be ascertained as well as their reading, listening and viewing habits. Messages or channels of communication that conflict with traditional beliefs and community practices must be avoided. Modern channels of communication can be associated with traditional cultural activities such as drama, puppet shows, street theatre and festivals to increase coverage of the population.

Coordination

Whichever media are used to diffuse information on health and nutrition, they must be coordinated with one another, and the messages transmitted must be coherent and consistent.

THEME 4

HEALTH AND SOCIAL STATUS OF WOMEN IN RELATION TO INFANT AND YOUNG CHILD FEEDING

Central health role of the mother

The mother plays a central role in child growth and development. She provides the total physical and psychological environment for the child from conception to delivery, and afterwards she continues as the provider of care and food to assure its biological and emotional needs for survival and healthy growth and development. The nutritional and health needs of the infant and young child are quite specific. For the first four to six months breastfeeding meets these needs. After that, foods given in addition to breast milk help meet the needs of the growing child and gradually adapt it to an adult diet and to greater independence. Whether the mother is able to meet the needs of the infant and young child, however, depends on her own health and socioeconomic status, and the responsibilities she has in the family and in society.

Needs of the mother

Women of childbearing age as well as infants and young children have quantititative and qualitative biological needs that call for special attention. Malnutrition in early infancy has been shown to affect the reproductive process in adult life; the mother who was herself malnourished as a child is less likely to have a successful outcome of pregnancy than one who was well nourished. And, although undernourished mothers can successfully breastfeed, they do so at their own expense and could do so much better if they were better fed. Excessive energy expenditure through physical work and stress can be equally detrimental to health during reproduction and lactation; it affects the physical wellbeing of the mother and reduces the time and energy she can devote to child care.

Women's roles in the family

In most countries, women play crucial roles in the maintenance of family life and health, in their reproductive and mothering roles as well as in their roles as wives, home-makers, workers, income earners, and food producers, handlers and preparers. They have been and for the most part continue to be, responsible for the daily activities basic to the health of the family. Women's roles in the production of food directly for the family diet or for family income is particularly important. Changes in agricultural systems and social structures as a whole may adversely affect this vital role.

The factors that influence the extent to which the mother can breastfeed, the opportunities she has to do so, the availability of food for her own diet during pregnancy and lactation, and the types of food she gives to her child during and after weaning, are determined by a combination of biological, psychosocial and economic conditions.

Factors influencing the health and social status of mothers

Contrary to expectations, there is evidence from many parts of the world that the condition of many mothers is deteriorating. This is especially true of developing countries and of poor people. In many instances this appears to be linked to changing life-styles, family structures and occupational roles, and more specifically, current patterns of development which are bypassing women and reducing their ability to meet the nutritional needs of their children.

Women have many interacting and sometimes competing roles and it is only by analysing these roles and the social value and support attributed to women through them, that women's part in meeting the nutritional needs of the infant and young child be understood and facilitated.

Competing pressures on women

Whereas traditional social systems implicitly encouraged and supported the role of women as mothers, modern industrial society especially in urban areas has introduced a variety of factors and values which have weakened such support. In much of contemporary society, work outside the home, psychological and social expectations and new economic needs, often conflict with the fulfilment of childrearing responsibilities. Many of the family and social mechanisms that previously facilitated breastfeeding have been eroded and not replaced by effective alternatives.

In some countries patterns of migration have contributed to this erosion of support; migration has tended to be selective from the point of view of both age and sex, and as a result women have often been left behind in rural areas, wholly responsible for continuing and maintaining family farms. Alternatively, women have migrated alone to cities where they are afforded little if any social or familial support and are economically (and socially) exploited. The number of single-parent families has risen especially where the single mother under present circumstances is least able to devote the necessary time and care to her infant. The economic status of women is also closely related to nutrition practices and in general calls for consideration.

Women and health care

In many places the curative type of health care available has not helped women in their reproductive role. One problem is the tendency for reproduction to be dealt with much the same as disease, rather than as a normal biological process requiring promotive and preventive support. As a result, the care provided has focused on problems rather than on systematically ensuring that each stage - pregnancy, delivery and lactation - is successfully managed.

The widespread lack of appreciation of the health needs of women, particularly during maternity, has also meant that in the family and community in general the support they need has not always been forthcoming. Social legislation, for example, has not been used as effectively as it might have been to protect maternity and facilitate the type and degree of support that mothers need.

Actions called for

A number of actions are necessary if the health and social status of women are to be improved and, through these, infant and young child feeding. Clearly, different actions are called for in different social, cultural and economic environments. These include actions within the health sector as well as other development sectors, such as industry and education. They encompass the actions of the official or formal systems and those of the nongovernmental or voluntary organizations and networks, and include support to women's organizations.

Women and their work-load

In most countries, for example, women's workload is excessive and interferes with breastfeeding and child care in general, as well as with the mother's health; this workload could be effectively reduced by a more rational and equitable division of labour within the family. This presupposes, however, a better understanding on the part of men and the community as a whole of the health needs of women in relation to infant and child care, and a willingness to change accordingly.

In some cases, the introduction of piped water, or improvements in water supply generally, would reduce the strain and time associated with the carrying of water. Similarly, improvements in home and village technology would enable safer storage and preparation of food, and would greatly contribute to reducing the work-load of women as well as making infant feeding safer.

Education of the public

Education of the public about the need to support mothers in caring for children must be promoted. As indicated elsewhere in this paper there is a general need for school curricula and other educational programmes to include parenthood, health needs, nutrition and the notion of shared responsibility for infant and young child feeding.

Consumer guidance

Because the changing nature of society is giving rise to new economic systems and patterns of food availability, purchasing and use, families and especially mothers need consumer guidance on budgeting and on the use of locally available ingredients in the preparation of supplementary and weaning foods.

Women and employment

The conditions of employment of women, including legislation to protect and support them, also requires attention in many countries. Industrial development should be planned in such a way that it is supportive of family and community life. Maternity leave and better job security should be seen as basic principles of social and economic development; this is especially true of those countries where women have traditionally been the main wage-earners for many families. To facilitate their entry into new types of employment, and to promote their employment, and their economic and professional mobility, women need vocational training and guidance. While this may not be easy under many circumstances, special attention should be given to ensuring that industry tries to accommodate to family patterns and their implications; families ought not to be expected to adapt to industry. Industrial employers could also provide day-care centres close to women's work-places and allow work-breaks for breastfeeding; and provide appropriate health care for working mothers. Part-time employment might be made more easily available to mothers so that, as so often happens, women are not faced with a choice between full-time employment or total exclusion from industry.

Other community-based measures could be encouraged, particularly for women working outside the industrial sector. The involvement of nongovernmental organizations in this regard is essential.

Health

The general health care of women may require review and modification. Systematic care should be ensured for all women and children at different stages in the continuum of reproduction. This will involve the education of the public, as MCH care is not limited to health services. In this context the advantages of breastfeeding must be carefully outlined; its relation to the wellbeing of the child and to birth spacing must be explained, as well as the special needs of the mother, if she is to breastfeed successfully and happily.

Primary health care

The MCH approaches are part of the new orientation of primary health care, and include giving priority to health promotion and prevention; to ensuring the availability of care for the total population; to participation of the community and collaboration with nongovernmental organizations; to the involvement of traditional resources, such as traditional birth attendants; and to intersectoral strategies.

THEME 5
APPROPRIATE MARKETING AND DISTRIBUTION OF BREAST-MILK SUBSTITUTES

The background information for this theme is not treated comprehensively here; this is to be found in part 2 of this document. The main points are reiterated when they bear on the subject under discussion.

Universal need for breastfeeding

Breastfeeding should be promoted in and for all situations where it is possible; it is ideally suited to the physiological, nutritional and psychosocial needs of all infants. Even in ideal socioeconomic and environmental conditions, artificially-fed babies are at a disadvantage for several reasons; these include the absence of breast-milk-related immunity and less close bonding between mother and child. In industrialized countries artificial feeding may not be regarded as an immediate public health problem, because families at most income levels can afford to use breast-milk substitutes in adequate quantities, and they have adequate knowledge and facilities to use them properly. Also the environment is usually healthy, and the health care system can help to prevent or deal with illnesses resulting from the infant's increased susceptibility to infections. Upper-income groups in developing countries may enjoy similar conditions.

Risk involved in use of breast-milk substitutes

For people in developing countries, however, the risks are so much greater that the use of breast-milk substitutes presents a major public health as well as an individual or family problem. Health risks arise from the poor environment and the wrong use of substitutes resulting from lack of information and of the equipment necessary to prepare and store them. These risks are in turn compounded by inadequate health care coverage. In addition, the cost of breast-milk substitutes in relation to low income severely strains the family budget and often leads to the use of overdiluted breast-milk substitutes which do not meet the infant's nutritional needs.

Use of breast-milk substitutes

Only when young infants cannot be breastfed is the use of breast-milk substitutes necessary. Illness or psychosocial pressures may bring about partial or complete lack of breast milk; partial artificial feeding may also have to be resorted to when the mother has to be away from home and the infant for long hours; even if work-places provide crèches and breaks for breastfeeding, the distances involved may sometimes prevent mothers from taking their infants to the work-place with them. Obviously the infant must be completely artifically fed if the mother dies, unless a wet-nurse is available. In all these circumstances breast-milk substitutes, either home-prepared or industrially prepared may have to be used to supplement or completely to replace breastfeeding. Industrially prepared products can offer a number of advantages but their cost is a serious disadvantage and a potential obstacle to their proper use.

The criteria which must always be used for choosing between home-prepared and industrial breast-milk substitutes should include (a) cost; (b) risk of errors in mixing, including over-dilution or contamination; (c) availability of milk; (d) environmental conditions, including storage facilities for milk or prepared breast-milk substitutes; (e) possibilities for adequate information, education and monitoring in relation to their proper use; and (f) age of infant. Public health authorities should make general recommendations, and health service staff, including primary health care workers, should advise and guide families in these matters.

Where, in some cases, lower-income families need help in obtaining breast-milk substitutes or milk for making them, eligibility for assistance and how it should be provided should be determined by health staff or social workers or other well-informed advisers. They should, among other things, ensure that if breast-milk substitutes are to be used, families have regular access to sufficient quantities of them.

Unjustified distribution

Breast-milk substitutes are widely used by those who choose not to breastfeed. Nevertheless, the marketing and distribution of breast-milk substitutes is pervading all segments of the population in the urban areas of developing countries and is also beginning in the rural areas. This is a situation that calls for a vigorous and realistic assessment of what can be done, nationally and internationally, to ensure that the health of infants is not jeopardized.

Marketing practices

At present, the practices used in marketing breast-milk substitutes vary according to the economic system of a given country, national policies on the marketing of these substitutes, the attitudes of medical and health authorities, and the policies and practices of companies. A combination of techniques is used, including promotion to medical and health personnel and institutions; advertising by mass media; persuasive labelling; distribution of free product samples or feeding accessories; introductory discount sales; and personal contact with mothers by company representatives in maternity wards or at home. Until recently, insufficient consideration has been given to the consequences of these marketing practices, or to the implications for infant health and for the family and the national economy of the widespread use of breast-milk substitutes.

Regulatory actions that can be taken

Some countries, however, have introduced specific measures including regulations for the distribution of breast-milk substitutes. In some cases, for example, information about breast-milk substitutes can be obtained only through health personnel and at their discretion. Similarly, breast-milk substitutes themselves are available only through health care systems where specific and carefully established criteria are used to determine when they are needed. The advertising potential for specific brands of products, moreover, has been limited in other instances by packaging them under a single product name. Feeding bottles have, in one country, been placed on prescription; this permits the health team to evaluate the need for them and also allows them to explain to mothers the risks of using them.

RECOMMENDATIONS OF JOINT WHO/UNICEF MEETING ON INFANT AND YOUNG CHILD FEEDING HELD IN GENEVA FROM 9-12 OCTOBER 1979

THE ENCOURAGEMENT AND SUPPORT OF BREASTFEEDING

Health care system

Because of the fundamental importance of the health of the mother for breastfeeding, which in turn is essential for the health and development of the infant, and because health services through the primary health care approach, especially where they relate to the health of mothers and children, have an importance preventive role to play, it is recommended:

During pregnancy

Every attempt should be made to ensure the sound nutritional status of women and that their nutritional and health needs are met, especially during pregnancy. The health care system in collaboration with other sectors, should help in identifying and utilizing existing local resources so as to ensure that the nutritional needs of the mothers are met.

The health care system in general should ensure that all mothers, particularly during the period of pregnancy, are systematically provided with the type of breastfeeding education that is in keeping with their life situations and presented in practical ways that are likely to enhance their understanding and acceptance of it.

Emphasis should be given to the fact that lactation is a natural biological process but that to some extent breastfeeding is an act which must be anticipated and reinforced. With adequate teaching and support almost all mothers are capable of breastfeeding and solving any problems which may arise. The best teachers will be breastfeeding mothers.

During pregnancy information and guidance should be provided to all mothers concerning preparation for breastfeeding and ways in which they can fully establish and maintain breastfeeding. The full cooperation of women's groups and other bodies working for the promotion of breastfeeding should be sought and supported by the health care system.

Attention should be given to ensuring that, wherever possible, all health workers in a position to provide adequate information to the mother on breastfeeding should be committed to the promotion of breastfeeding and have a thorough knowledge of its management.

Care should be given during the pregnancy period to identifying those mothers who are likely to be, because of their special social, economic or health condition, at high risk of not breastfeeding and special care should be given to them so as to enhance improvement of their situation and the establishment of breastfeeding.

Delivery

Obstetrical procedures and practices should be consistent with the policy of promoting and supporting breastfeeding. In this respect, unnecessary sedation, routine use of episiotomy, and routine use of lactation suppressants should be avoided.

Breastfeeding should be initiated as soon after birth as possible, normally during the first half-hour and, in order to facilitate breastfeeding, mothers should be permitted and encouraged to keep their infants with them in the same room or close to them and to practise on-demand feeding; maternity routines and structures should be conducive to this practice.

Health-related staff, including traditional birth attendants, should seek to provide mothers not only with educational information but also with practical help and should be provided with appropriate information on the preparation for and management of breastfeeding.

The role of the father and other members of the extended family in providing support for the mother should be emphasized in all prenatal, maternity and postnatal care and fathers should be invited to participate actively with the health team in encouraging the mother to breast-feed.

After delivery

All postnatal health care should be oriented towards ensuring the maintenance of breastfeeding for as long as possible. All babies should receive colostrum. For optimal breastfeeding, the use of supplementary bottle-feeding - water and formula - should be avoided. A healthy well-nourished mother who is fully breastfeeding her infant should not need to introduce any complements until after the first 4-6 months of life, according to the needs of the infant.

Mothers' nutritional status should be reviewed and, whenever possible, steps taken to ensure that the mother has access to adequate food intake.

The contraceptive effect of breastfeeding should be well recognized, although additional family planning methods should be promoted to ensure birth spacing. Preference should be given to contraceptive methods which do not interfere with the normal process of lactation.

All attempts should be made to ensure that in cases where infants need to be hospitalized facilities are provided so that the mother can be with the infant and continue breastfeeding or that the baby can continue to receive breastmilk. Where it is not possible for the biological mother to breastfeed, the first alternative, if available, should be the use of human breastmilk from other sources. Human milk banks should be made available in appropriate situations.

The terms "humanized" and "maternalized" milk for infant formula should be avoided.

Support through the health services

Health service staff must play a critical role in the initiation, establishment and maintenance of breastfeeding and should ensure that the mother has a source of sustained support for as long as breastfeeding continues, and thus health workers should be well informed and provide consistent information.

A baby who is not breastfed should receive special attention from the health care system. Adequate instructions for the use of infant foods as well as warnings about its problems should be the responsibility of the health care system. Supplies of infant formula would thus be required for distribution only where necessary and not as a routine.

Employed mothers

Paid maternity leave of not less than three months postnatal, job security and economic support should be provided to all mothers whenever possible, and wherever possible, and the responsibility for economic support during maternity leave should be carried by government, the industry in which the woman is working, and other relevant national and international institutions.

Crèches, paid breastfeeding breaks and other facilities should be provided, wherever appropriate, in industry, and in other relevant institutions, or close to the place of work to permit mothers to continue breastfeeding and have close contact with their babies. Financing of crèches and other mechanisms that allow for this continued contact of breastfeeding should be carried by government and/or the industry in which the mother is working.

Community and government support

All channels of communication, including religious leaders, school teachers and other community opinion leaders and voluntary associations, particularly women's organizations, should be actively involved, together with health services and other sectors, in encouraging and supporting breastfeeding and sensitizing the community to the value of breastfeeding and the needs of the mother and baby through home visits, if necessary.

Messages concerning infant and young child feeding should be consistent from one sector to another and from one population group to another, and therefore the promotion of breastfeeding and appropriate infant and young child feeding practices in general should be set within the context of overall maternal and child health practices, national nutrition policies and primary health care.

Governments should be encouraged to set up national expert groups to advise them on policies about breastfeeding and to establish coordinating offices that can ensure consistency and continuation of supportive activities and implementation of ongoing evaluation and monitoring as well as systematic epidemiological research including social factors.

WHO/UNICEF and other organizations should be responsible for encouraging regional and national workshops for the promotion of appropriate infant and young child feeding.

PROMOTION AND SUPPORT OF APPROPRIATE AND TIMELY COMPLEMENTARY FEEDING (WEANING) PRACTICES WITH THE USE OF LOCAL FOOD RESOURCES

Food complementary to breastmilk will need to be introduced by 4-6 months; when the nutrition of the mother is poor and/or environmental conditions are unfavourable, it may often need to be introduced earlier. However, too early introduction of supplements may have a negative effect on breastfeeding and may also increase the risk of infection.

The diet of the young child after cessation of breastfeeding needs special attention, because inadequate feeding at this time often leads to clinical forms of malnutrition, particularly when the child is denied the breast as a consequence of a new pregnancy.

In order to guide the mother as to the adequacy of her child's nutrition and the appropriate time to introduce weaning foods, programmes to support her in keeping a graph of her infant's weight and to understand its significance should be extended as widely as possible. The WHO publication "A growth chart for international use in maternal and child health care" provides valuable guidance for doing so.

Foods that are locally available in the home can be made suitable for weaning, and their use should be strongly emphasized in health, education and agricultural extension programmes. Foods traditionally given to infants and young children in some populations are often deficient in nutritional value and hygiene, and need to be improved in various ways. Mothers need guidance to improve these traditional foods through combinations with other foods available to them locally. Countries should determine the need for subsidizing weaning foods or otherwise helping to ensure their availability to low-income groups.

Governments and relevant public or private organizations should support practical and appropriate initiatives and policies for improving the nutritional value and hygienic standards of traditional and other locally used weaning foods, for achieving a balanced diet for infants, for educating mothers in the proper feeding of children, and for facilitating the exchange of weaning and child-feeding experiences among countries.

To avoid infection and interference with continued breastfeeding, infants during weaning should not be fed by bottle but rather by cup and spoon or other suitable traditional vessels and utensils. When mothers do not initiate breastfeeding, or terminate it prematurely, so that animal milk or perhaps vegetable milk mixtures or products may need to be fed by bottle, competent guidance should be available to the individual mothers to ensure that the mixture or product fed is nutritionally adequate, both in quantity and quality, and that all possible measures are taken to see that it does not become a vehicle for infection.

Psychological, social and economic factors that constrain breastfeeding should be minimized.

These questions should be the subject of further research and subsequent scientific meetings.

STRENGTHENING OF EDUCATION, TRAINING AND INFORMATION ON INFANT AND YOUNG CHILD FEEDING

Every citizen has the right to have access to correct, consistent information and education; therefore, countries must ensure that information and education be provided to all levels and that the messages reach those for whom they are intended at community, intermediate and central level.

In all educational (formal and non-formal), vocational and professional training programmes, the interrelationship of all knowledge relating to health protection, breastfeeding and adequate nutrition of the mother, infant and child should be featured.

To ensure maximal effectiveness, educational and informational activities about nutrition must:

- be adapted to local conditions and culture;
- be directed to the target population, viz. school children, youth, pregnant and breastfeeding mothers, men, community leaders, decision-makers and planners;
- be supported by necessary resources from those sectors responsible for periurban and rural economic development;
- be undertaken with the active participation of men, husbands, other family members, and community leaders;
- be linked to measures for income-generation at family and community level;
- utilize local cultural methods of communication, such as folk-arts, drama and music.

To support women and mothers in their efforts to improve their health and nutritional status and that of their infants and children, it is important that nutrition education and information be provided to various other individuals who are influential with the family, such as fathers, grandparents, mother-surrogates, community teachers and others who have an impact on the social behaviour and nutritional habits of vulnerable groups, and the education and information should be carried out with their participation.

It is strongly recommended that governments should provide adequate nutrition training in medical and nursing schools, adequate training to primary health care workers, including midwives, particularly in prenatal and perinatal services, school teachers, rural extension workers and others operating at the community level to enable them to undertake functional health and nutrition education in the community, based on the priority needs of the people and with their active participation. The outcome of these endeavours should be increased self-reliance at the community and family level.

It is essential that all personnel who will provide nutrition education be appropriately trained, not only in techniques of communication and education but also in child development and in delivering consistent and coherent nutrition and health concepts and practices based on the local sociocultural conditions.

Training

Basic and continuing education and upgrading of information on all aspects of breastfeeding is necessary for health service staff at all levels, including administrators, professional leaders at medical and nursing schools, physicians (especially obstetricians and paediatricians), nurses and midwives at all levels, medical assistants, auxiliaries, social and extension workers. Training should place particular emphasis on management of breastfeeding and be related to the economic, cultural and social background of the mother and family. Training should consist of the appropriate knowledge on available culturally acceptable, locally grown foodstuffs which are suitable for use as weaning foods for the young infant and supplementary foods for the pregnant and lactating woman. Health service staff should also be enlightened about the dangers and hazards of advertising infant foods in clinics.

The use of mass media, which in many countries include radio, TV, newspapers, advertisements for formula and other infant food products, in government and professional journals should be effectively screened by appropriate government ministries to ensure that they do not detract from official nutrition policies designed to protect breastfeeding nor to the health and nutritional status of mothers and children.

There is not enough information about the present state of education/training in the field of maternal, infant and young child nutrition throughout the world. The meeting strongly recommends that this be reviewed as soon as possible and followed up every five years in order to evaluate the activities in this field and to use it for updating the programmes. International organizations, especially WHO/UNICEF, FAO, UNESCO and UNIDO should collaborate in this activity. This also implies collaboration in the preparation of guidelines aimed at identifying problems related to health and nutrition status of mothers and children, particularly regarding conditions of breastfeeding and weaning practices, and on methods of surveillance.

DEVELOPMENT OF SUPPORT FOR IMPROVED HEALTH AND SOCIAL STATUS OF WOMEN IN RELATION TO INFANT AND YOUNG CHILD HEALTH AND FEEDING

Status of women

Participation of women

Women's role and experience in infant feeding is unique and the importance of women gaining greater control of actions affecting this aspect of their lives must be emphasized. It is recommended, therefore, that women's participation in all related actions be significantly increased through:

(i) increased representation of women in all follow-up meetings and actions as recommended by this meeting, including increased involvement of women in the activities of United Nations agencies, nongovernmental organizations, and other groups, including industry and trade unions;

(ii) the increased recognition and involvement of women's organizations in community, national and international efforts, for the promotion of improved infant and young child feeding and related primary health care efforts;

(iii) the increased involvement of women in policy formulation and decision-making at all stages of planning and implementation of related national programmes.

Health and nutritional status of women

Improved infant and young child feeding is closely linked with women's enjoying a high status of health throughout all stages of life, especially in the reproductive cycle. It is recommended that measures be taken to ensure good nutrition and health for all women through:

(i) measures directed towards health care, socially and economically available, particularly according to primary health care, including the provision of balanced and sufficient nutritional intake, especially during pregnancy and lactation, and family planning information and services; special attention should be given to reproductive health and education of adolescent girls with specific action for pregnant adolescents;

(ii) the implementation of activities aiming to reduce women's workload, both in the home and outside the home, including actions to promote the sharing of tasks within the family and including development programmes related in particular to the provision of plentiful and clean water and the use of appropriate technologies.

Measures to support women to breastfeed

The woman is pivotal for all action related to breastfeeding. Breastfeeding is best for the health of the young baby, but also for the health of the mother including the physical, emotional, and psychological aspects of her health.

The majority of women living in rural areas and in the urban periphery are not covered by protective or legislative measures; they are either not wage-earners or are workers without adequate security. Very little has been done for these women. It is recommended therefore that government action and community development activities, including the help of breastfeeding mothers, be taken to support these mothers to breastfeed. Programmes to develop appropriate technologies (especially regarding food production and handling) to reduce these women's workload and to organize community-based day care of children should be emphasized.

Governments should ratify and apply the ILO conventions through national legislation concerning maternity protection which are to be developed (and which extend existing protective measures to increase the period of time of maternity leave) for facilitating breastfeeding, including facilities for breastfeeding, paid nursing breaks, flexible schedules, day care centres and other measures to ensure the physical closeness of mother and child; these measures should ensure that women's earnings are not substantially reduced or that complementary measures are introduced to provide subsidies; and that any discrimination of nursing mothers in employment should be prohibited. Women's groups and trade unions should pressure governments to ensure the ratification and implementation of appropriate legislation. The ILO, together with WHO and UNICEF and other United Nations agencies, should continue its activities in the application of legislation and protection of breastfeeding mothers.

Specific educational and nutritional programmes within primary health care should be directed towards pregnant women to prepare them psychologically and physically to breastfeed their baby.

Weaning

Women play important roles in the production, preparation and serving of food within the family. The home preparation of appropriate weaning foods will depend on their knowledge, time, human energy and resources.

(i) In all cases where there is access to local food products, it is necessary to teach women and other family members to use these as weaning foods as part of the family diet.

(ii) in cases where women do not have easy access to locally available foods, action should be taken for the organization of community efforts, such as cooperatives, to make such local foods available to women;

(iii) educational and other community development programmes related to health and nutrition should be linked with income-generating activities and policies;

(iv) all food aid programmes in this area should take cognizance of the local food content and habits, and not create a situation of dependency and should be careful not to compete with breastfeeding and local food production.

Information, education and training

The importance of an adequate basis on which women can have a true and objective choice emphasizes the need for education and information about infant and young child feeding and for the establishment of measures at government levels to protect women against misinformation. Information and education about infant and young child feeding should be directed to men as well as women in order to enable them to assume their supportive responsibilities.

Educational materials to be directed to the general public, to school children, and to the training of health and other development workers, should project a positive image of women not only in their roles as mothers but also as workers and citizens of the community. This would refer to the images as seen in books and other written material as well as the mass media.

Women's nongovernmental organizations should organize extensive consciousness-raising campaigns for generating policy actions by governments and launching extensive information dissemination campaigns in support of breastfeeding and good weaning habits. At the local level nongovernmental organizations are urged to organize and carry out women-to-women programmes to promote breastfeeding and adequate weaning. In these activities nongovernmental organizations should collaborate with WHO and UNICEF, with the necessary support from national and international agencies.

As in most instances the health care providers to mothers and children are women, special efforts should be directed to strengthen training programmes for these groups of workers to include a comprehensive component of family planning, infant and young child feeding, and other aspects of family health within primary health care.

For all, education of the public - especially of the young generations - should aim at a better acceptance of breastfeeding as the natural and healthiest practice, taking into account cultural specificities, endogenous practices and using all channels of education as well as the media.

In collaboration with all relevant sectors, particularly health, education, agriculture, industry, governments need to ensure that up-to-date, scientific and empirical information on infant and young child feeding be widely disseminated and applied. A government mechanism must be established to ensure that through continuous screening and monitoring information and publicity relative to maternal, infant and young child feeding are correct and appropriate and that undesirable and inappropriate messages and publicity are eliminated.

A national strategy for communication and education should be formulated to mobilize available resources, this strategy to include training of manpower at all levels to plan, implement, evaluate and conduct research with respect to communication programmes.

Women have the right to correct and full information; even objective information, however, can be misleading and harmful if it is given in inappropriate settings or times. In regard to the meeting of infant formula, women's organizations should be involved in national councils or government agencies in the monitoring and enforcement of marketing codes dealing with the regulation of information and publicity. Women in all parts of the world - in developed and developing countries - should express their solidarity in deciding what is best in this unique and important part of their lives.

APPROPRIATE MARKETING AND DISTRIBUTION OF INFANT FORMULA AND WEANING FOODS

The government of each country has the responsibility to promote coherent food and nutrition policies which should give special attention to mothers, infants and children. These policies should emphasize the preservation of breastfeeding and the implementation of appropriate nutritional guidance (calendrier nutritionel). Governments have a duty to ensure the supply and availability of adequate infant food products to those who need them, in ways that will not discourage breastfeeding. Informed advice should be given at the appropriate time and place to mothers and families about best infant and young child feeding practices.

Breastfeeding is the only natural method of feeding babies and it should be actively protected and encouraged in all countries. Therefore, marketing of breast-milk substitutes and weaning foods should be designed not to discourage breastfeeding.

There should be no sales promotion, including promotional advertising* to the public of products to be used as breast-milk substitutes or bottle-fed supplements and feeding bottles. Promotion to health personnel should be restricted to factual and ethical information.

There should be an international code of marketing of infant formula and other products used as breast-milk substitutes. This should be supported by both exporting and importing countries and observed by all manufacturers. WHO/UNICEF are requested to organize the process for its preparation, with the involvement of all concerned parties, in order to reach a conclusion as soon as possible.*

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* This includes the use of mass media and other forms of advertising directly to the mother or general public, designed to increase sales of breast-milk substitutes, to the detriment of breastfeeding.

Monitoring of marketing practices is recommended. Usually this will be done under government auspices. Advertising councils and industry, consumer and professional groups can make an important contribution.

There should be no marketing or availability of infant formula or weaning foods in a country unless marketing practices are in accord with the national code or legislation if these exist, or, in their absence, with the spirit of this meeting and the recommendations contained in this report or with any agreed international code.

Facilities of the health care system should never be used for the promotion of artificial feeding. Therefore, advertising or promotional distribution of samples of breast-milk substitutes through health service channels should not be allowed. Artificial feeding should not be openly demonstrated in health facilities.

No personnel paid by companies producing or selling breast-milk substitutes should be allowed to work in the health care system, even if they are assigned more general responsibilities that do not directly include the promotion of formulas, in order to avoid the risk of conflict of interest.

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* This process is well advanced; see Introduction.

Production and distribution of foods for infants and young children should be governed by strict legal standards. They should be labelled to indicate proper and safe home preparation. Governments should adopt the recommended international standards covering foods for infants and young children developed by the Codex Alimentarius Committee on Foods for Special Dietary Uses and should support the elaboration of standards by this Committee to ensure nutritional value and safety. Governments that have not yet adopted such codes or regulations are urged to do so.

Products that are not suitable alone as weaning foods, such as sweetened condensed milk, cornstarch, cassava flour and cereal flours, should be required by proper regulations not to be packaged, labelled, advertised or otherwise promoted in ways that suggest they should be used as a complement or substitute for breast milk. For this purpose, vigorous educational efforts should be made against their misuse by mothers.

RESOLUTION WHA 33.32 OF THE THIRTY-THIRD WORLD HEALTH ASSEMBLY

23 May 1980

INFANT AND YOUNG CHILD FEEDING

The Thirty-third World Health Assembly,

Recalling resolution WHA27.43 of the Twenty-seventh World Health Assembly on "Infant nutrition and breast-feeding" and resolution WHA31.47 which in particular reaffirmed that breastfeeding is ideal for the harmonious physical and psychosocial development of the child, that urgent action is called for by governments and the Director-General in order to intensify activities for the promotion of breastfeeding and development of actions related to the preparation and use of weaning foods based on local products, and that there is an urgent need for countries to review sales promotion activities on baby foods and to introduce appropriate remedial measures, including advertisement codes and legislation, as well as to take appropriate supportive social measures for mothers working away from their homes during the lactation period;

Recalling further resolutions WHA31.55 and WHA32.42 which emphasized maternal and child health as an essential component of primary health care, vital to the attainment of health for all by the year 2000;

Recognizing that there is a close interrelationship between infant and young child feeding and social and economic development, and that urgent action by governments is required to promote the health and nutrition of infants, young children and mothers, inter alia through education, training and information in this field;

Noting that a Joint WHO/UNICEF Meeting on Infant and Young Child Feeding was held from 9 to 12 October 1979, and was attended by representatives of governments, the United Nations system and technical agencies, nongovernmental organizations active in the area, the infant food industry and other scientists working in the field;

1. ENDORSES in their entirety the statement and recommendations made by the joint WHO/UNICEF meeting namely on the encouragement and support of breastfeeding; the promotion and support of appropriate weaning practices; the strengthening of education, training and information; the promotion of the health and social status of women in relation to infant and young child feeding; and the appropriate marketing and distribution of breastmilk substitutes. This statement and these recommendations also make clear the responsibility in this field incumbent on the health services, health personnel, national authorities, women's and other nongovernmental organizations, the United Nations agencies and the infant food industry, and stress the importance for countries to have a coherent food and nutrition policy and the need for pregnant and lactating women to be adequately nourished.

The joint meeting also recommended that "There should be an international code of marketing of infant formula and other products used as breastmilk substitutes. This should be supported by both exporting and importing countries and observed by all manufacturers. WHO/UNICEF were requested to organize the process for its preparation, with the involvement of all concerned parties, in order to reach a conclusion as soon as possible";

2. RECOGNIZES the important work already carried out by the World Health Organization and UNICEF with a view to implementing these recommendations and the preparatory work done on the formulation of a draft international code of marketing of breastmilk substitutes;

3. URGES countries which have not already done so to review and implement resolution WHA27.43 and resolution WHA32.42;

4. URGES women's organizations to organize extensive information dissemination campaigns in support of breastfeeding and healthy habits;

5. REQUESTS the Director-General

(1) to cooperate with Member States on request in supervising, or arranging for the supervision of the quality of infant foods during their production in the country concerned as well as during their importation and marketing;

(2) to promote and support the exchange of information on laws, regulations, and other measures concerning marketing of breastmilk substitutes;

6. FURTHER REQUESTS the Director-General to intensify his activities for promoting the application of the recommendations of the joint WHO/UNICEF meeting and, in particular:

(1) to continue efforts to promote breastfeeding as well as sound, supplementary feeding and weaning practices as a prerequisite to healthy child growth and development;

(2) to intensify coordination with other international and bilateral agencies for the mobilization of the necessary resources for the promotion and support of activities related to the preparation of weaning foods based on local products in countries in need of such support and to collate and disseminate information on methods of supplementary feeding and weaning practices successfully used in different cultural settings;

(3) to intensify activities in the field of health education, training and information on infant and young child feeding, in particular through the preparation of training and other manuals for primary health care workers in different regions and countries;

(4) to prepare an international code of marketing of breastmilk substitutes in close consultation with Member States and with all other parties concerned including such scientific and other experts whose collaboration may be deemed appropriate, bearing in mind that:

(a) the marketing of breastmilk substitutes and weaning foods must be viewed within the framework of the problems of infant and young child feeding as a whole;

(b) the aim of the code should be to contribute to the provision of safe and adequate nutrition for infants and young children, and in particular to promote breastfeeding and ensure, on the basis of adequate information, the proper use of breastmilk substitutes, if necessary;

(c) the code should be based on existing knowledge of infant nutrition;

(d) the code should be governed inter alia by the following principles:

(i) the production, storage and distribution, as well as advertising of infant feeding products should be subject to national legislation or regulations, or measures as appropriate to the country concerned;

(ii) relevant information on infant feeding should be provided by the health care system of the country in which the product is consumed;

(iii) products should meet international standards of quality and presentation in particular those developed by the Codex Alimentarius Commission and their labels should clearly inform the public of the superiority of breastfeeding;

(5) to submit the code to the Executive Board for consideration at its sixty-seventh session and for forwarding with its recommendations to the Thirty-fourth World Health Assembly, together with proposals regarding its promotion and implementation, either as a regulation in the sense of Articles 21 and 22 of the Constitution of the World Health Organization or as a recommendation in the sense of Article 23, outlining the legal and other implications of each choice;

(6) to review the existing legislation for enabling and supporting breastfeeding, especially by working mothers in different countries, and to strengthen the Organization's capacity to cooperate on the request of Member States in developing such legislation;

(7) to submit to the Thirty-fourth World Health Assembly, in 1981, and thereafter in even years, a report on the steps taken by WHO to promote breastfeeding and to improve infant and young child feeding, together with an evaluation of the effect of all measures taken by WHO and its Member States.

Seventeenth plenary meeting,
23 May 1980
A33/VR/17.

PART 2
BACKGROUND INFORMATION

This second part of the document is intended to be a compendium of background information relevant to the themes for discussion. It is not, and makes no pretentious to being, a "scientific treatise" on infant and young child feeding, rather it is hoped that the contents will stimulate further discussions and research where needed of the issues involved. It is based on contributions received from a number of well-known experts in the fields covered and some findings of the WHO Collaborative Study on Breastfeeding have also been included.*

As regards content, part 2 considers the nutritional needs of the infant; it describes lactation, the composition and volume of human milk, and the variations that can occur in its composition and volume. To what extent and how long breastfeeding can meet the nutritional needs of the infant under different circumstances are questions of fundamental importance.

During the transitional period from intrauterine life to a state of relative independence in the external environment, protection from infection is of vital importance. The contribution of breastfeeding to this protection is reviewed. Both specific and nonspecific anti-infective factors in human milk are discussed, in particular the capacity of human milk to protect infants against gastrointestinal infections, which represent a major threat particularly in developing countries.

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* see p. 130 for a description of this study.

Other matters raised in this part of the document include bonding between the infant and mother which is facilitated and promoted by breastfeeding.

The association between breastfeeding and birth spacing is considered, pregnancy spacing being so important for the nutritional status of both mother and infant and for the very necessary continuous contact between them.

A brief historical review of the trends in the prevalence and duration of breastfeeding in developed and developing countries is then given. This is followed by a description of the critical period of supplementation and weaning together with its close association with the ecological and socioeconomic conditions of different parts of the world.

2.1 NUTRITIONAL NEEDS IN INFANCY

Infancy is the period of transition from intra-uterine to extra-uterine life, and to a state of relative physiological independence. During this period the child is entirely dependant for its survival on the care and feeding provided by the mother. Infancy is characterized by rapid growth and development and changing needs. Meeting these needs is basic to survival and healthy development.

Energy needs

The peak of the postnatal growth spurt in the normal infant occurs at between two and four weeks, but the infant continues to grow rapidly for several months. The median rate of gain in weight between birth and four months of age is over 25 g/day. By contrast, between 12 and 18 months of age the median rate of weight gain is about 8 g/day.

Energy needs during the first months of life are determined mainly by the rate of growth and by the composition of the newly synthesized tissue. The synthesis of fat needs much more energy than that of other tissues. Much of the rapid weight gain of the first four months is accounted for by fat; energy expenditures for growth are therefore high and non-growth energy expenditures relatively low; growth accounts for about one-third of the infant's total energy needs during this period.

After four months, when weight gain is slower, much less is accounted for by fat; growth requires much less energy, but energy needs increase to maintain the larger size and greater activity of the child. The energy content of the newly synthesized tissue is less. Between 12 and 18 months of age, only 2-3% of energy needs is accounted for by growth. In this respect, the child between one and two years more closely resembles the non-growing adult.

The healthy infant or child is the best judge of its own energy needs. Normally, energy intake should neither be restricted below nor urged beyond the child's wishes.

Average energy needs for infants have been proposed by the WHO/FAO Expert Committee on Energy and Protein Requirements in 1971. Ranges of intake representing approximately the tenth to the ninetieth percentiles observed in normal infants and young children are presented in Table 1.

Table 1. Observed intakes of energy

Age	Energy intake (kJ/kg/day)
Birth - 1 week	250-460
1-6 weeks	400-590
6-12 weeks	360-540
3-36 months	310-500

Proteins and amino acids

Like energy, growth accounts for a high proportion of total protein needs in the early months of life. For this period of rapid growth, protein need is expressed better per unit of energy intake than per unit of body weight. At a specific ratio of protein energy in the diet, the greater energy consumption by rapidly growing infants assures greater intakes of protein.

Full-size infants have been estimated to need 0.38 g of protein per 100 kJ during their first four months, and 0.34 g/100 kJ to the end of the first year. These estimates for protein per unit of energy intake do not differ greatly from the protein-to-joule ratio of human milk. Experience suggests that an infant receives enough protein when its entire energy intake comes from feeding at the breast of a well-fed woman. Assuming that human milk provides on an average 11 g of protein and 3.1 MJ/litre, the ratio of protein to joules is 0.35 g/100 kJ.

While the ratio of protein to joules in human milk is undoubtedly adequate for the breastfed infant, very little is known about the effects of feeding infants the same ratio of protein to energy from other protein sources.

For artificial feeding, and taking into account individual variability, the WHO/FAO Expert Committee on Energy and Protein Requirements has recommended advisable intakes of 2.40 g protein/kg/day for infants under three months of age, and 1.85 g protein/kg/day for infants between three and six months of age. These figures correspond approximately to 0.48 g/100 kJ and 0.38 g/100 kJ.

Needs for essential amino acids, i.e., those which the body is unable to synthesize either at all or in sufficient quantity, must be considered in much the same way as needs for protein. Growth needs have to be distinguished from maintenance needs. Growth needs are related to the rate of synthesis of various tissues and their amino acid composition. Maintenance needs depend on: (1) the rate of turnover of various body tissues; (2) their amino acid composition; and (3) the extent to which various amino acids released at protein degradation can be recycled into anabolic processes. Because growth needs for individual amino acids are not likely to be the same as those for maintenance, and because of differences in amino acid metabolism, the needs of rapidly growing infants for essential amino acids are different from those of older children or adults.

Estimates of infant needs for essential amino acids must be evaluated carefully. Most studies have used semi-synthetic diets containing mixtures of amino acids rather than whole proteins.

Table 2 shows preliminary estimates of amino acid requirements in infancy, expressed in relation to energy intake. They apply to circumstances in which whole proteins are fed in amounts not greatly exceeding the protein requirements. Under the conditions of the studies from which these estimates are derived, needs for individual amino acids were no greater than those listed in Table 2. For some essential amino acids the needs may be lower.

Table 2. Preliminary estimates of requirements for amino acids by infants

Amino acid	mg/100 kJ
Histidine	6.2
Isoleucine	15.8
Leucine	31.6
Lysine	24.2
Phenylalaline	13.6
Methionine	5.7
Cystine	3.1
Threonine	14.1
Tryptophan	3.8
Valine	19.9

Source: S.H. Fomon, 1979.

Note: Because of the manner in which these estimates were made, the true requirement for several of the amino acids is likely to be substantially less than the preliminary estimates given here.

Water

The requirement of water during infancy is approximately 150 ml/kg. This is provided by breast milk when the energy needs of the infant are met.

Other essential nutrients

The needs of other essential nutrients have been estimated with varying degrees of accuracy, and recommended intakes for each of them therefore include a margin of safety. These recommended intakes should be taken into account when designing formulas for artificial feeding. Breastfed infants will satisfy their needs of all essential nutrients if their energy requirements are met and the mother is healthy and well-nourished.

Achieving advisable intakes

In addition to meeting the needs of energy and specific nutrients, some balance should be achieved between sources of energy. For the infant who is not breastfed protein should provide 8-15% of energy intake, fat 20-50%, and carbohydrate the remainder. To ensure good quality, about half the protein should be in the form of animal protein, or a mixture of vegetable proteins, so as to provide the estimated requirements of essential amino acids (see Table 2). The formulas used for artificially-fed infants must contain all the essential nutrients. A recommended concentration of essential nutrients for infant formulas has been outlined by the WHO/FAO Food Standards Programme, Codex Alimentarius Commission. Usually the breastfed infant needs to have other foods introduced into its diet between four and six months of age.

2.2 HUMAN MILK

Lactation is an integral part of human reproduction, growth and development. In humans, as in other mammals, it has evolved according to the needs of the species.

Preparation for lactation

Preparation of the female body for lactation and breastfeeding begins during puberty with the development of the breasts. Hormonal changes stimulate growth of the breasts and nipples. The main changes taking place at this time are the development of the stroma, which consists of fat and connective tissue, and of the alveoli. The branching of ducts to form lobules in the breasts also occurs at this time.

Pregnancy

Once conception occurs and gestation begins the breast begins to grow and develop further. The ducts and alveoli increase in number, the latter change in colour and the nipple becomes longer and more protractile. Under the influence of luteal and placental sex steroids (estrogens), acidophilic and eosinophilic prolactin cells in the pituitary increase in number and volume to become the dominant cells in the hypertrophied gland. These same sex steroids also stimulate the further growth of structures that produce and eject milk. In the third and fourth weeks of gestation more terminal ductules sprout, and lobules and alveoli begin to form. Prolactin induces proliferation and differentiation of epithelial stem-cells. These give rise to two other kinds of stem-cells; myoephithelial and milk-synthesizing presecretory cells. At the end of the third month of gestation the two-cell larger alveolar epithelium changes into a monolayer secretory epithelium. Besides prolactin, placental lactogens and possibly growth hormones participate in the glandular development.

Maternal energy reserves that can later be used to support lactation are accumulated and deposited in the subcutaneous tissue of the trunk and legs. The healthy expectant mother thus reaches the end of pregnancy with a large store of energy.

Maternal weight gain is such that by the fortieth week of pregnancy about 12.5 kg may have been accumulated. If the mother's diet during pregnancy is insufficient or her work-load too heavy, she may not be able to accumulate fat; she will then gain less weight than normal. Lactation in such a case will result in the depletion of the mother's tissues.

Near term the breasts become heavier, the subcutaneous veins are dilated, and mammary blood flow is almost doubled. The increase in breast volume is due to the dilatation of milk-ducts and alveoli, partly filled with colostrum. In addition, there is hypertrophy of mammary myoepithelial cells and connective tissue, increased deposition of subcutaneous fat, and retention of water and electrolytes. At the same time, epithelial cells synthesize milk fats and proteins but little is secreted into the alveolar lumen. Fat globules acccumulate in alveolar secretory cells.

Lactose production depends on the synthesis of alpha-lactalbumin, which is inhibited by progesterone during pregnancy.

The puerperium

The initiation of lactation depends essentially on prolactin. The blood level of prolactin rises during pregnancy to reach, before delivery, 20 times that in the non-pregnant women. The potential action of prolactin and placental lactogen hormone on milk synthesis is inhibited by estrogen and progesterone. This inhibition disappears rapidly after birth, and prolactin then stimulates the synthesis of different proteins, including alpha-lactalbumin and fats. One week after birth the prolactin level declines sharply.

During the first post-partum days sucking stimulates brief prolactin discharges into the blood. This is followed by the synthesis of milk by the alveolar cells and its secretion into the milk canals. Pituitary oxytocin initiates contraction of the peri-alveolar cells, squeezing the milk into the terminal lacteols. Emptying of the gland encourages further milk synthesis by diminishing alveolar pressure, permitting increased milk secretion by the myoepithelial cells. Sucking stimulates the hypothalamus to produce the hormonal release of milk. This is the physiological basis for the "let-down reflex". Once breastfeeding has been established the let-down reflex is also controlled by emotional stimuli. The let-down reflex functions to control the flow of milk.

At the beginning of nursing, prolactin secretion is pulsatile with a peak blood level 15-20 minutes after nipple stimulation. When breastfeeding continues and there is continuous stimulation of the nipples, the basal prolactin level may remain elevated for 15 or more months. Feeding on demand keeps prolactin levels high.

Milk volume

A substantial flow of milk is established by the third or fourth day after birth. The volume and flow of milk will then increase until about the fifteenth day. Peak milk volume values of about 800 ml per day are usually attained between the fourth and sixth weeks, and can be maintained at least until the end of the sixth month.

Reported daily volumes of milk produced by mothers in industrialized countries range between 750 and 1000 ml; in developing countries, particularly among the poor, these volumes tend to be lower but are usually sufficient to meet the needs of the infant, at least for the first three to four months of life.*

With a long interval between night feeds, as is common in Europe and North America, the breasts yield more milk at the first morning feed than at subsequent feedings. One breast may yield more or less milk than the other; the difference, which is consistent, may be as much as 25%.

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* Milk volume and composition is the subject of a study currently being carried out by WHO in 5 countries.

Differences reported in the volume of milk produced by mothers often reflect different methods of measurement. Test feeding - weighing of the infant before and after each breastfeed over a 24-hour period - essentially measures the infant's ingestion of milk; this is influenced by both the secretory capacity of the breast and the child's appetite and sucking ability. Measuring the milk expressed from the breast manually or mechanically indicates only the capacity of the breast to secrete. In each case the measurements may be affected by the test environment: the psychological aspects of the let-down reflex are sensitive to both types of measurement. A new method of measuring milk intake using measurements of heavy water (D_2O) enrichment in the saliva of the breastfeeding infant has recently been described. It has the advantage that it does not interfere with feeding habits and gives the average daily milk intake over a more representative period than is usually possible with test-weighing.

Factors influencing the volume of milk

The diet and fluid intake of the mother can influence her yield of milk, although the interaction of diet and milk volume production is not well understood. It has been suggested that mothers in developing countries and from poor communities in industrial societies tend to have a lower mean yield than most European and North American mothers.

The psychosocial environment in which the mother feeds is also important. Emotional disturbance and anxiety in general can interfere with the let-down reflex and hence with the flow of milk. Milk yield may then reflect not so much the breast's capacity to produce milk as the hormonal and psychological mechanisms that permit its secretion. Milk yield is also related to the frequency and force with which the infant sucks. Poor and infrequent stimulation of the nipple leads to lower yields and earlier weaning.

The poor sucking ability of the pre-term low-birth-weight infant is likely to reduce secretion, unless the milk is expressed manually or mechanically.

Some drugs affect milk production: for example, high levels of estrogens in oral contraceptives may reduce milk yield. Alcohol, by suppressing oxytocin release, may interfere with the let-down reflex. Drugs that increase the secretion of prolactin, such as chlorpromazine or methyldopa, may enhance milk yield but are not considered therapeutically useful in this respect.

Milk composition

Colostrum

Colostrum is often present before the end of pregnancy but is secreted mainly during the first five post-partum days. It contains less fat and lactose than mature milk and more sodium, chlorine and zinc. It is high in antibody-rich protein, especially secretory immunoglobulin A (SIgA) and lactoferrin. Itsfunction is primarily anti-infective, but by reason of its biochemical composition it may also have a laxative or proteolytic effect to facilitate clearing out the meconium and possibly to supply concentrated doses of certain nutrients, such as zinc. The protein concentration of colostrum falls rapidly from levels of over 20 g/l in the first 3 days of lactation, to about 15 g/l on the seventh day. Thereafter it falls gradually to about 11 g/l at between 4 and 6 weeks. The lactose content shows marked variability in the first few days of lactation. In general it rises from under 60 g/l to about 63 g/l on the seventh day, and to 70 g/l once mature milk is established.

The fat content varies widely during the first weeks of lactation; it is relatively low in colostrum and rises progressively until it reaches approximately 45 g/l in the third week. The proportion of polyunsaturated long-chain fatty acids is much higher in colostrum than in mature milk.

Mature milk

The protein level of mature human milk, as indicated in Table 3, is of the order of 11 g/l. This is about three times less than in cow's milk and lower than in most other mammals. The proportion of casein is particularly low, resulting in soft curd and easy digestibility.

Table 3. Composition of breast milk

	Colostrum (first 5 days postpartum		Transitional milk (6-10 days post-partum)		Mature milk (15 days to 15 months post-partum)		Cow's milk	
	Mean	Experimental range	Mean	Experimental range	Mean	Experimental range	Mean	Experi-mental range
Energy								
(MJ/litre)	2.81	2.46-3.06	3.08	2.84-3.47	3.13	1.87-4.99	2.93	2.46-3.67
(kcal/litre)	671	588-730	735	678-830	747	446-1 192	701	587-876
Solids, total (g/l)	128	100-167	133	105-156	129	103-175	124	119-142
Ash, total (g/l)	3.08	2.47-3.50	2.67	2.31-3.38	2.02	1.6-2.66	7.15	6.81-7.71
Minerals								
Sodium (g/l)	0.50	0.26-1.37	0.29	0.19-0.54	0.17	0.06-0.44	0.77	0.39-1.40
Potassium (g/l)	0.74	0.66-0.87	0.64	0.53-0.77	0.51	0.37-0.63	1.43	0.38-2.87
Calcium (g/l)	0.48	0.24-0.66	0.46	0.23-0.63	0.34	0.17-0.61	1.37	0.56-3.81
Magnesium (g/l)	0.04	0.03-0.08	0.03	0.03-0.05	0.03	0.02-0.06	0.13	0.07-0.22
Phosphorus (g/l)	0.16	0.08-0.25	0.20	0.10-0.32	0.14	0.07-0.27	0.91	0.56-1.12
Sulfur (g/l)	0.23	0.20-0.26	0.20	0.15-0.23	0.14	0.05-0.30	0.30	0.24-0.36
Chlorine (g/l)	0.59	0.43-1.01	0.46	0.31-0.72	0.37	0-09-0.73	1.08	0.93-1.41
Cobalt (μg/l)	-	-	-	-	Trace	-	0.6	-
Iron (mg/l)	1.0	-	0.59	0.29-1.45	0.50	0.20-0.80	0.45	0.25-0.75
Copper (mg/l)	1.34	-	1.04	-	0.51	-	0.10	-
Manganese (mg/l)	Trace	-	Trace	-	Trace	-	0.02	0.01-0.07
Zinc (mg/l)	5.59	0.72-9.81	3.82	0.39-5.88	1.18	0.17-3.02	3.9	1.7-6.6
Fluorine (mg/l)	-	-	-	-	0.03	0.0-0.05	0-03	-
Iodine (mg/l)	-	0.04-0.45	-	-	0.06	0.04-0.09	0.08	0.04-0.10
Selenium (mg/l)	-	-	-	-	0.02	0.01-0.04	0.04	0.01-0.07

Protein								
Total (g/l)	22.9	14.6-68.0	15.9	12.7-18.9	10.6	7.3-20.0	30.9	28.5-34.8
Casein (g/l)	-	-	5.1	4.2-5.9	3.7	1.4-6.8	24.9	21.9-28.0
Whey protein (g/l)	-	-	-	-	7	4-10	7	6-10
"Lactalbumin" (g/l)	-	-	7.8	6.9-8.6	3.6	1.4-6.0	2.4	1.4-3.3
"Lactoglobulin" (g/l)	-	-	-	-	-	-	2.1	1.3-3.8
Amino acids								
Total (g/l)	12.0	7.0-40.0	9.4	6.0-10.0	12.8	9.0-16.0	33.0	27.0-41.0
Nonprotein nitrogen								
Total (mg/l)	910	510-1 270	479	425-533	324	173-604	252	181-323
Carbohydrates								
Lactose - directly estimated (g/l)	57	11-79	64	61-67	71	49-95	47	45-50
Fats								
Total (g/l)	29.5	24.7-31.8	35.2	27.3-51.8	45.4	13.4-82.9	38.0	34.0-61.0
Cholesterol (mg/l)	280	180-345	241	126-320	139	88-202	110	70-170
Vitamins								
Vitamin A (mg/l)	1.61	0.75-3.05	0.88	0.58-1.83	0.61	0.15-2.26	0.27	0.17-0.38
Carotenes (mg/l)	1.37	0.41-3.85	0.38	0.23-0.63	0.25	0.02-0.77	0.37	0.12-0.79
Vitamin D (IU/l)	-	-	-	-	-	4-100	-	5-40
Tocopherol (mg/l)	14.8	2.8-30.0	8.9	4.0-18.5	2.4	1.0-4.8	0.6	0.2-1.0
Thiamine (mg/l)	0.02	0.01-0.03	0.06	0.02-0.11	0.14	0.08-0.23	0.43	0.28-0.90
Riboflavin (mg/l)	0.30	0.12-0.45	0.37	0.27-0.49	0.37	0.20-0.79	1.56	1.16-2.02
Vitamin B_6 (mg/l)	-	-	-	-	0.18	0.10-0.22	0.51	0.40-0.63
Nicotinic acid (mg/l)	0.75	0.50-1.45	1.75	0.60-3.60	1.83	0.66-3.30	0.74	0.50-0.86
Vitamin B_{12} (μg/l)	0.06		0.10	0.04-0.39	0.34	0.21-0.46	2.48	-
Folic acid, free (ug/l)[a]	5.0	-	5.7	-	14	10-19	90	62-100
Panthothenic acid (mg/l)	1.83	0.29-3.02	2.88	1.35-4.12	2.46	0.86-5.84	3.4	2.2-5.5
Ascorbic acid (mg/l)	72	47-104	71	45-90	52	0-112	11	3-23

Source: Reproduced from Documenta Geigy Scientific Tables, 7th and 8td editions. Courtesy Ciba-Geigy, Basle, Switzerland.

Notes: A dash (-) means no data available. [a] Determined with *Lactobacillus casei*.

The concentration of the major carbohydrate, lactose, is high and plays an important role in maintaining low electrolyte concentration.

Fat is the main source of energy, fat-soluble vitamins and essential fatty acids in human milk. Levels of essential polyunsaturated fatty acids, especially linoleic acid and alpha-linolenic acid are higher in breast milk than in cow's milk. The fatty acid pattern of milk may vary somewhat according to the mother's diet. The milk of European mothers, who consume a high-fat diet, contains more long-chain saturated and mono-saturated fatty acids than that of African or Asian women, who tend to have relatively high proportions of shorter-chain acids.

During a feed the concentration of fat rises by up to 40 g/l and the content of lactose and protein falls slightly.

The infant's stores of fat-soluble vitamins at birth are related to the mother's diet during pregnancy. The milk of a well-fed mother contains enough fat-soluble vitamins for maintenance. The concentrations of vitamin A and carotenoids, and of tocopherol, are high in colostrum; they fall as the milk matures. The amount of tocopherol corresponds to the quantities of polyunsaturated fatty acids. Vitamin D in human milk occurs in the form of water-soluble sulfate; the significance of its occurrence in this form is still under study.

All water-soluble vitamins in the mother's plasma readily reach her milk; their concentrations depend largely on her diet but are generally sufficient for the infant if the mother is well nourished.

When mothers are themselves deficient in some vitamins such as thiamine or vitamin A, their milk cannot meet the infant's needs for these; this has serious health consequences. In such cases the mother's diet should be supplemented with the specific vitamins.

With regard to minerals, the low concentration of sodium in breast milk is of considerable clinical importance because of the limited capacity of the newborn kidney to deal with a heavy load of solute.

Although human milk has lower concentrations of calcium and phosphorus than other milks, the supply is ample. The calcium is particularly well absorbed compared to calcium in cow's milk, for the following reasons: the pH of the gut is lower in the breastfed than in the formula-fed child and calcium is less liable to combine with human milk protein because of its low casein content; it is also less liable to combine with fat because human milk is far better absorbed and human milk contains much less phosphorus.

The concentration of iron in human milk is low but it is well absorbed (60% to 70%). Human milk, therefore, provides enough iron for a full-term infant throughout the first months of life.

A number of enzymes have been described in human milk, but their nutritional significance is unknown.

Factors affecting the composition of milk

Fluctuations in the fat content of human milk occur diurnally and during feeds. Fat content has also been observed to vary with environmental and emotional conditions. The levels of prolactin may also control mammary fat synthesis.

The content of protein, lactose, fat and calcium is not signficantly affected by the nutritional status of the mother. The content of other nutrients, such as water and liposoluble vitamins, varies according to the mother's diet.

Almost all drugs including hormonal contraceptives taken by lactating women are excreted in small amounts in breast milk; the same caution advised in respect of the use of therapeutic drugs in pregnancy should be extended to lactation. Alcohol passes readily from the blood to the fetus and later to the breast milk. Similarly infants born to heroin addicts suffer withdrawal symptoms and should not be breastfed by their mothers. Little is known of the effects of nicotine due to heavy smoking on the output and composition of milk or on the infant.

Environmental pollutants such as herbicides, pesticides, and similar substances have been found in human milk as well as in cow's milk, but many of them have not yet been proved harmful to the breastfed infant. However, other pollutants such as certain mercury compounds consumed by the mother in fish or cereals contaminated by fungicides can have very serious effects of infants.

Anti-infective properties of human milk

Not only is human milk an ideal source of nutrients for the infant, but it also contains anti-infective components. These comprise specific immunological factors such as lymphocytes and antibodies as well as a number of nonspecific factors. Among the latter are phagocytic granulocytes and macrophages; various proteins including lactoferrin, lysozyme, complement factors and B_{12}-binding protein; lactoperoxidase; and the "bifidus factors".

The specific immunological factors in human milk

Lymphocytes: The number of leucocytes in milk varies widely, it is highest in colostrum: from 0.11 x 10^6 to 11.6 x 10^6/ml. The numbers fall in the first few weeks towards 10^4 to 10^5/ml. The proportion of lymphocytes varies from a few per cent to 20-30%. Most are T lymphocytes but many B lymphocytes also appear. In comparing the responsiveness of milk T lymphocytes with that of blood T lymphocytes some authors have found discrepancies which suggest that milk T lymphocytes are not representative of general T cells. The possible presence of lymphocyte-inhibiting components in the milk has been indicated.

The B lymphocytes in human milk have been reported as producing immunoglobulin A (IgA) primarily, as demonstrated by in vitro synthesis experiments and specific plaque-forming cell assays. Because of the considerable technical problems involved in separating milk cells, these observations require further confirmation.

Antibodies: Since Ehrlich's studies in the 1890s it has been clear that milk contains antibodies that can protect the breastfed infant. Some 20 years ago it was found that the antibodies in human milk differed from those in serum IgA. It is composed of an IgA dimer stabilized by two additional glucopeptides: the J chain and the secretory component (SC). The resulting molecule called secretory IgA (SIgA) is much more resistent to enzyme attacks and pH changes than serum antibodies. Certain bacteria produce proteolytic enzymes that can degrade SIgA. These enzymes seem to degrade the subgroup IgA1, which may be less common than IgA2 in secretory IgA. A reductase from liver that can split SIgA has also been found, and similar enzymes can be produced by certain Escherichia coli.

IgM and IgG antibodies are found in human milk but at lower levels than in serum. For instance, mean ratio for milk/serum antibodies to E.coli O antigens on the fifth day after parturition is 0.6 for IgM and 0.2 for IgG. The IgM level drops from about 1 g/l in colostrum to about 0.1 g/l a week later; after that it is often undetectable. The IgG level in colostrum is about 0.2-0.3 g/l, falling to less than 0.1 g/l in mature milk.

By contrast, the mean ratio for milk/serum IgA is 3:2. In colostrum, the concentration of SIgA is between 1 and 20 g/l declining to about 0.5 g/l in mature milk. However, this rapid decrease in antibody levels is compensated for by the simultaneous increase in milk volume, so that daily intake of antibodies by the breastfed baby is fairly constant throughout lactation, after an initial drop. A comparison of the daily output of SIgA protein or specific SIgA antibodies to E.coli of privileged and underprivileged mothers has shown no difference between the two groups.

It is remarkable that human milk contains SIgA antibodies against several antigens from microorganisms usually found in the gut. Moreover, milk SIgA antibodies appear after intestinal exposure to microbial antigens as well as food products. For instance, a group of rich urban women who could afford to drink cow's milk and eat meat were found to have high SIgA antibody levels against bovine proteins in their milk, in contrast with poor women from the same area who could rarely obtain such food.

This close connexion between antigenic exposure in the gut and the mammary glands exists because the milk SIgA dominates all secretions. It is produced by special lymphoid cells, many of which originate from the Peyer's patches in the gut. Such cells leave the patches, presumably after antigenic exposure, and move to other parts of the intestinal mucosa. It is also probable that they can move to other sites where exocrine secretions that bathe mucous membranes are produced and therefore reach the mammary gland. As a result of the gut-mammary link, mucosal defence against the mother's intestinal microbial flora is transferred in the form of milk SIgA to the intestine of the breastfed baby, who is exposed to the same flora. This constitutes a very specialized immune system to provide the infant with considerable amounts of antibodies to protect the mucous membranes, particularly those of the intestines. These SIgA antibodies are resorbed only in insignificant amounts.

Earlier evidence that human milk antibodies were not taken up by the infant was believed to indicate that they were of no particular value to the infant. It is now clear, however, that the SIgA antibodies of human milk are produced specifically to protect the mucous membranes. This is presumably significant since most infections occur *via* mucous membranes and the young infant is quite slow in producing SIgA antibodies.

SIgA antibodies against a large number of different enterobacteria have been found in human milk, e.g., antibodies against O antigens of *E.coli* strains of serogroups that commonly cause neonatal sepsis and meningitis. SIgA antibodies are also consistently found against *E.coli* K antigens, including the K1 capsule found on about 80% of *E.coli* causing neonatal meningitis. Furthermore, antibodies to *V. cholerae* O antigen and enterotoxin, and a large variety of *Shigella* and *Salmonella* O antigens, are found in the milk of women living in areas where disease caused by these organisms are endemic.

Fewer and less virulent forms of *E.coli* occur in the intestines of breastfed infants than in those who are not breastfed. For instance, *E.coli* carrying the K1 virulence antigen seem to be less common in the intestines of breastfed than of non-breastfed infants. However, it has been noted that the presence of SIgA antibodies to various *E.coli* O and K antigens in the maternal milk does not prevent the colonization of the breastfed baby with *E.coli* carrying such antigens. The neonates show no symptoms of this colonization even with *E.coli* that is known to be a potential pathogen.

It has been noted that, even when pathogens like Shigella appear in the intestines of exposed infants, those who are breastfed show no symptoms or only mild ones as compared with those who are not. The explanation is complex; these bacteria may be limited by the various anti-infective factors in human milk. The major function of SIgA antibodies is to bind the bacteria to prevent their attaching themselves to the mucosal epithelium and thus initiating infection. This anti-adherence activity demonstrated against E.coli, V.cholerae and Streptococci is more likely to be sufficient if invading bacteria are few in number.

SIgA antibodies to several viruses occur in human milk. They include antibodies against rotavirus, the common diarrhoea agent; against poliovirus, presumably reflecting maternal immunity; and against coxsackie, enterovirus, influenza A virus and respiratory syncytial virus.

As indicated above, SIgA antibodies to food proteins eaten by the mother appear in her milk. Besides the antibodies to bovine proteins already mentioned, antibodies against soy proteins and black beans are found where these form part of the diet.

Nonspecific anti-infective factors in human milk

Phagocytes: Between 40% and 60% of human colostral cells are neutrophil granulocytes and 30-50% are macrophages. There is much individual variation and different figures are reported.

These phagocytes take up bacteria in *in vitro* experiments. In some studies, efficient elimination of *E.coli* and *Staphylococcus aureus* has been noted; in others, it has been less efficient. It has been suggested that human milk IgA can suppress IgG-mediated phagocytosis of *Candida albicans* by granulocytes.

Lactoferrin: Human milk is rich in lactoferrin. This iron-binding protein has a bacteriostatic effect on iron-requiring microorganisms such as *E.coli*, *Streptococcus mutans* and *Candida albicans*. The bacteriostatic effect is potentiated by antibodies, including milk IgA, to the microorganisms. The antibodies interfere with the synthesis of the iron-binding compound, enterochelin, used by the microorganisms to supply themselves with iron. Addition of iron counteracts the effect of lactoferrin. However, there is no firm evidence that an oral iron supplement increases the risk of infection in humans, although haematin can enhance bacterial growth in the small intestine of suckling guinea-pigs. (If iron is given parenterally there is definitely such a risk.)

Other factors: Mature human milk contains about 0.1 g/l of *lysozyme*. It may have anti-infective effects due to its ability to cleave the peptidoglycans present in the cell wall of Gram-positive bacteria and enterobacteria.

The *lactoperoxidase* present at low levels in human milk, acting with hydrogen peroxidase and thiocyanate ions, has an antibacterial effect on streptococci. The possible effects of this in the breastfed baby have not been evaluated.

A B_{12}-binding protein found in human milk also may have an antibacterial action.

The *complement factor* C3 is found at serum concentrations in colostrum but only at 5-10% of serum concentration in mature milk. C4 also is present in milk, but these factors are not able to retain activity during their intestinal passage in the infant. However, SIgA, which cannot activate complement, may lyse *E.coli* via the complement system in the presence of lysozyme.

The "*bifidus factors*", nitrogen-containing polysaccharides found in human milk but almost lacking in bovine milk, help *Lactobacilli* to reach high numbers in the intestine of breastfed babies. The resulting production of acetic and lactic acids lowers the pH of the stool, inhibiting growth of various Gram-negative bacteria and fungi. The poor buffering capability, as well as the high lactose and low protein content of breast milk, may also have an effect in enhancing the growth of *Lactobacilli*.

The mechanisms of prevention of infections by human milk

Several studies indicate that breastfed infants have fewer gastrointestinal infections than those not breastfed. This is especially striking in developing countries where there are high risks of diarrhoeal diesease, but it has also been reported from some developed countries.

The reported effectiveness of breast milk in controlling nursery epidemics due to enteropathogenic E.coli is consistent with the high milk levels of SIgA antibodies to such bacteria in countries where these infections are common. In a recently reported epidemic due to 055 E.coli, severe symptoms appeared only in babies who were not breastfed, whereas the few breastfed babies with positive stool cultures were only mildly affected.

Other studies, in a developing country, have strikingly demonstrated that breastfed babies were rarely colonized with enterophathogenic E.coli or Shigella. When colonization took place, the bacteria disappeared rapidly and caused no symptoms. On weaning, the intestinal flora changed characteristically to higher numbers of E.coli, and diarrhoeal disease of various etiologies increased. Pathogens like Shigella, which cause severe diarrhoea in artificially-fed infants, cause only insignificant symptoms in those who are breastfed is another indication of the protective value of human milk.

The protective effect of the milk SIgA antibodies against rotavirus may be important because this is such a common cause of diarrhoea. The poliovirus antibodies of human milk can neutralize poliovirus, since it has been noted that breastfeeding with colostrum inhibits the effect of immunization with oral live poliomyelitis vaccine of the infant.

Some reports indicate that breastfeeding may diminish the number of respiratory infections, including otitis media and respiratory syncytial virus infections.

The anti-allergic properties of human milk

Genetically sensitized infants are at high risk of developing atopic allergy; when both parents have atopic disease the risk is about 65%. Breastfeeding of infants at risk, by avoiding foreign proteins, may diminish the risk of developing allergy.

As mentioned above, human milk contains SIgA antibodies against food proteins eaten by the mother. SIgA antibodies may prevent or diminish contact between antigens and mucous membranes. This is reinforced by the finding that infants suddenly transferred from human milk to cow's milk formed more serum antibodies to the bovine proteins than infants kept on mixed feeding with breast milk and cow's milk for more than 3 weeks. A gradual exposure of the mucosa gives the infant time to develop its own SIgA response in the gut, possibly diminishing the risk of allergic reactions to food. It has, however, been argued that intestinal immunological tolerance to food proteins is best attained by sudden exposure to large amounts.

Improving the protective capability of human milk by maternal immunization

Parenteral cholera immunization of women with serum and milk *V.cholerae* antibodies after natural exposure, boosts not only serum antibodies but also the SIgA milk and saliva antibodies. This suggests that maternal immunization protects the breastfed infant as well as the mother. By contrast, women with no previous exposure to cholera react to immunization with serum antibodies but not with SIgA antibodies in milk and saliva.

Parenteral immunization with killed poliovirus, of women previously exposed to poliomyelitis, has been shown to increase the milk SIgA antibodies as well as the serum antibodies. In women without milk antibodies, presumably not previously exposed to poliovirus, only a small and temporary milk antibody increase occurred. In those previously exposed, immunization with oral live poliomyelitis vaccine decreased the milk SIgA antibody levels. This decrease was especially striking when the poliovirus vaccine was given at the same time as cholera vaccine.

These preliminary immunization data suggest that it is possible to direct and improve breast-milk mediated immunity in the infant by immunizing mothers against specific infections. The data suggesting that oral immunization with live poliovirus diminishes intestinal protection could explain the unsatisfactory results with this vaccine in some developing countries.

Possible disadvantages of human milk

Several viruses, or viral antigens, including rubella, hepatitis B and cytomegalovirus have been found in human milk. There is no evidence, however, that they are transmitted by the milk. It is notable that when they are present the milk also contains SIgA antibodies, possibly transferring immunity to the child.

Group B Streptococci have been isolated from milk and they also cause infection in infants; however, there is no evidence that the infection in infants is caused by Streptococci in the breast milk. Tuberculosis is transferred via the milk to the breastfed baby only if the mother has caseating granuloma of the breast.

2.3 BREASTFEEDING

Healthy growth and development in infancy depends on specific psychological, emotional and physical care as well as nutrition and defence against infection. Of all mammalian species the human infant is perhaps the one most dependent on external agents for protection and stimulation. The biological mother has always provided this care and affective interaction. To do so she must at least communicate with the infant and be physically able to provide care. From many points of view breastfeeding helps to satisfy this.

Bonding

Bonding, or the attachment that occurs between mother and offspring, is a result of close and prolonged contact between them. Bonding in humans is in many ways like that in other mammals but it is based primarily on close interaction and body language. Physical contact is an important basis for bonding, and breastfeeding therefore facilitates it. Research has consistently shown, moreover, that early and continued contact between mother and infant also helps to establish breastfeeding and to maintain it for a long time. While non-breastfeeding mothers and their infants may have similar relations the frequent contact implicit in breastfeeding practically assures bonding. It is a mutual relationship; both mother and infant elicit responses that are mutually gratifying and that in turn reinforce the attachment between them.

Maternal response

Breastfeeding, because it is a natural care-eliciting behaviour - giving food, oral contact, skin-to-skin contact and physical warmth - helps to promote psychophysiological interactions.

During breastfeeding, there are also a number of generalized body responses associated with breastfeeding such as raised temperature of the mammary skin and rhythmical contractions of the uterus. Failure to experience a rise in mammary skin temperature and uterine contractions (perceived as uterine pain in breastfeeding on the second day post-partum) have been shown to be related to failure of lactation.

Continued elevated levels of prolactin and oxytocin in the wholly breastfeeding mother is associated with suppression of menstruation and ovulation and some psychophysiological changes.

Infant response

In the infant the satisfaction of hunger, oral gratification and sensation, physical and emotional warmth, protection from a hostile environment, and the frequent psychosocial interaction with the mother are all associated with breastfeeding. In the case of the baby who is being fully breastfed and particularly if fed on-demand, giving the breast is a common response by the mother to crying or other signs of distress or discomfort in the baby; physical contact between the mother and infant is thus brought about.

Detailed study of feeding activity in breastfed and artificially-fed infants has shown marked differences between them in their sucking behaviour; the breastfed infant soon develops both more interest and more vigour in sucking than does the artficially-fed infant. In the older baby, the response to being breastfed is often one of general rhythmic movements of the feet and toes; this type of reaction is not seen as often in the artificially-fed infant. Breastfed infants display more bodily activity in general than do the artificially fed; one expression of this is the tendency of breastfed babies to begin to walk earlier than the others.

The breastfed infant has a generally softer stool and passes it more often than the infant fed on cow's milk and this may also be important in reducing psychophysiological stress and promoting the infant's wellbeing.

The timing and quality of the initial contact between mother and infant are important for breastfeeding and bonding. Bonding is helped by the act of breastfeeding and by the better health and wellbeing in the infant that results from the regular bodily contact of breastfeeding.

Any consideration of the psychological and emotional adaptation of the infant should also take account of the role of the father. Not only is he an important figure in the care of the infant and a model for later life, but he, together with other members of the family, also supports the mother and helps to assure her wellbeing.

Breastfeeding and child spacing

Adequate child spacing can mean the difference between complete recuperation of the mother and depletion of her physical resources. It can also mean the difference between adequate care of the preceding child, including its continued breastfeeding, and early abrupt weaning from the breast due to a new pregnancy and hence the deprivation of maternal attention.

The effect of lactation on menstruation and ovulation

It is well known that breastfeeding delays the return of menstruation and ovulation after parturition, and mothers who breastfeed are therefore less likely to conceive than those who do not. The precise relation has been the subject of considerable research, most of which has been concerned with measuring the duration of the post-partum amenorrhoea. The results of a WHO Collaborative Study on Breastfeeding, which among other things examined the reported return of menstruation, indicated a consistent and close relation between the duration of breastfeeding and the duration of post-partum amenorrhoea. Everywhere the return of menstruation was seen to follow the pattern of weaning. In developing countries, economically well-to-do mothers who breastfed for a shorter time also had shorter post-partum amenorrhoea. In rural traditional mothers who breastfed mostly till the eighteenth month, the return of menstruation was significantly delayed. An analysis of the information showed that about 85% of the total variability between countries and study groups in the return of menstruation could be attributed to reported differences in duration of breastfeeding.

In more homogenous socioeconomic societies, differences in return of menstruation were also clearly associated with breastfeeding. In Hungary, 63% of mothers who were breastfeeding reported a return of menstruation before 8 months; whereas it had returned by that time in 98% of those who were not breastfeeding.

Similar differences were observed in most of the other groups studied and, as can be seen in Table 4, they were especially marked among the urban poor and the rural populations.

Table 4

	Percentage of women reporting a return of menstruation at, or before, 8 months post-partum	
	Breastfeeding	Not breast-feeding
Chile: Urban poor	64	96
Chile: Rural	71	100
Ethiopia: Urban poor	31	90
Guatemala: Urban poor	43	100
India: Middle income	62	100
Nigeria: Middle income	54	91
Philippines: Urban poor	44	91
Philippines: Rural	41	94

Differences observed in duration of post-partum amenorrhoea between social groups in India also suggest that, as well as breastfeeding, the state of health and nutrition of the mother may be associated with the return of menstruation. Frequent stimulation of the nipple is a factor in the production of prolactin, and prolactin is known to be related to continued suppression of menstruation: the undernourished mother may tend to breastfeed more frequently, and the baby may have to suck more vigorously at the nipple.

Reports by different authors suggest considerable variation in the average length of post-partum amenorrhoea in mothers from different geograhical and socioeconomic backgrounds. Some of the variations observed may be due to differences in definition and methodology. Thus, there may be confusion between true menstruation, post-partum haemorrhage, and withdrawal bleeding provoked by medications (e.g., estrogen given to suppress lactation).

The time it takes for ovulation to return may depend on such factors as the amount of stored energy at parturition, the diet, the amount of energy the women expend on work and child care, and basal body metabolism. Such a relation between nutrition and return of ovulation may partly explain the differences between different social groups in the length of post-partum amenorrhoea observed in the WHO Collaborative Study.

There has been debate on whether, after parturition, the return of menstruation is preceded by ovulation or menstruation precedes ovulation. Very little study has yet been done on the return of ovulation after parturition under varying lactational conditions. Determination of the first post-partum ovulation requires such techniques as endometrial biopsy, recording of basal body temperature, vaginal cytology and the repeated observation of cervical mucosa, as well as the close and continued cooperation of the mothers. It has been claimed that post-partum amenorrhoea is followed on an average by two anovulatory cycles. Until recently this view was generally accepted. The result of a study of 200 lower-middle-class women in Chile in 1972, however, seem to call this view in question. On the relation between ovulation and menstruation and lactation it was concluded:

> "Resumption of menstruation during full breast-feeding is preceded by ovulation less than half the time; a first period during partial breast-feeding is preceded by ovulation in almost 75% of cases; while first menses after suspended breast-feeding follow ovulation in 90% of cases."

The precise relation between breastfeeding and menstruation/ovulation is not entirely clear. As explained above, initiation and maintenance of lactation depend on the secretion of prolactin by the posterior pituitary gland. At delivery, serum prolactin concentration increases rapidly and remains high as long as breastfeeding is continued.

High levels of prolactin are associated with the inhibition of gonadotrophin release from the pituitary; raised serum prolactin concentration appears to inhibit ovarian steroid synthesis or to reduce the sensitivity of the ovary to pituitary gonadotrophin stimulation. This inhibitory effect of prolactin disrupts the carefully balanced release of pituitary and ovarian hormones needed for ovulation and the resumption of normal menstrual cycles.

Conception and child spacing

The breastfeeding mother, especially if she is breastfeeding completely, is less likely to become pregnant than the non-breastfeeding or the partially breastfeeding mother. This has been demonstrated by numerous studies, some of which are described below. While there are physiological explanations for the observed differences, many cultures have specific practices and taboos concerning post-partum sexual relations, which also reduce the likelihood of a new conception.

Historical data concerning mean birth intervals in certain European population groups during the seventeenth to the nineteenth centuries indicate that signficantly shorter birth intervals elapsed following the death of an infant or fetus that when the infant survived. Assuming that breastfeeding was widely practised and that contraception was not generally practised, the observed difference in birth interval - generally of the order of 5-10 months - can be attributed to lactation. However, because little is known about the other factors such as sexual abstinence, this explanation must remain a hypothesis.

Data gathered in the WHO Collaborative Study show considerable differences in average birth intervals between different study groups; in developing countries shorter intervals were more common among high-income groups than among rural and urban low-income groups. There is, as expected, a positive association between average birth interval and average length of lactation.

In some cultures a new pregnancy causes the abrupt weaning of the youngest child. In others, where there are no taboos against continued breastfeeding after a new conception, mothers may continue to breastfeed. In the WHO Collaborative Study 70% of the urban poor mothers in India who were pregnant at the time of the interview were still breastfeeding. The effect of a new pregnancy on milk volume and composition is not well known, nor are its effects on the health of the mother who continues to breastfeed, or on the health and development of the fetus.

Lactation and contraception

The impact of prolonged lactation on fertility at community level is considerable. For the individual, however, prolonged lactation as a birth-spacing method is less reliable. In the WHO Collaborative Study from 1% to 11.% of women became pregnant whilst still breastfeeding and before the return of menstruation. Modern contraceptive methods are therefore generally recommended. Choice of method needs critical appraisal in terms of its possible effect on both the volume and the composition of the milk. While mechanical methods do not influence lactation, certain hormonal preparations may interfere with lactation. In view of the possible effects of hormonal contraceptives on lactation and on breastfed infants, the WHO Expert Committee on Maternal and Child Health, in 1976, recommended that, until new information became available, whenever post-partum contraception was indicated, methods of fertility regulation other than hormonal should be used. If hormonal contraceptives are requested by the woman, the progesterone only preparation should be the choice. This is particularly important for communities where breastfeeding is essential for the child's survival and wellbeing.

The WHO Special Programme of Research, Development and Research Training in Human Reproduction poses three basic questions that remain to be answered:

(i) What effects might steroid contraceptives have on the breastfeeding performance of a lactating mother and on the nutritional state of her infant?

From a number of studies the consensus appears to be that hormonal contraceptives containing 50 ug or more of estrogen have adverse effects on milk supply and the duration of lactation. The trend, when combination pills are prescribed, appears to be towards the use of new low-dose preparations (less than 50 ug of estrogen); few data are available on the effects of these on lactation, but the limited data available suggest some reduction in milk volume. Injectable long acting DMPA or norethisterone enanthate do not reduce milk volume, and the effect of the progesterone-only pill is not well documented. The effect of either the 50 mg or 30 mg ethinyl estradiol dose on infant weight gain is not clear cut.

(ii) To what extent and in what form, biologically active or inactive, might such steroids be transferred through the milk to the infant?

There is evidence that very small quantities of the order of 0.02% to 0.13% of the maternal hormonal contraceptive dose of some steroids are transferred through breast milk, but the extent to which the transferred products are biologically active, and the nature of the activity, are not yet known.

(iii) What long-term consequences, if any, could such transfer have for the health of the infant?

There is no answer yet to this question.

These issues are important if breastfeeding is to be actively promoted, and if mothers are to be encouraged to space pregnancies in order to protect their own and their children's health.

Trends in breastfeeding

Breastfeeding traditionally has been a necessary part of infant care, and while there were no feasible alternatives it was practised by nearly all mothers. Industrialization in Europe and North America, however, introduced new patterns of family structure and life-styles which especially affected women; these changes in turn prompted new attitudes to infant feeding and care.

Historical background

Before the twentieth century, the alternatives to breastfeeding by the biological mother were wet-nursing - breastfeeding by another lactating woman - and the use of animal milk. The extent to which they were used is not known but both methods were associated with higher than usual rates of mortality to such an extent as to be documented on a number of occasions. The gradual appearance of processed infant foods specifically adapted to the nutritional needs of infants, and safer than unprocessed animal milk, met a need. Their widespread marketing served to promote their use even further. The use of breast-milk substitutes has been in turn associated with an increased use of feeding bottles which often are used also for feeding the infant with fluids other than formulas.

On the whole, information about changing patterns of infant feeding, especially breastfeeding, is relatively sparse and concerns mainly developed countries; however, recently, increasing attention has been paid to the developing world. Moreover, because few nationally representative studies have been conducted, the evaluation of trends has most often been based on group data and study-specific data, which may or may not be typical of broader national or regional patterns.

Historical accounts indicate that the decline in breastfeeding was associated with industrialization, and that by the late nineteenth century, and certainly by the early twentieth century, alternative forms of feeding were relatively common in industrial urban communities.

Trends in developed countries

In 1947-48, 41% of babies followed in a study in Newcastle-upon-Tyne, England, were on some form of mixed feeding at one month of age, and by 3 months the proportion had risen to 76%. A further study about the same time reported that in another area of England, Southport, 76% of the babies followed up were being at least partially bottlefed at 8 weeks. Information for other areas suggests a similar trend: according to a 1968 survey in Dundee, Scotland, only 42% of the babies studied were still being wholly breastfed at 2 weeks; and in London, in 1969, it was estimated that only 33% of mothers were wholly breastfeeding beyond the first 4 weeks.

Studies in Warsaw, Poland, suggest that until 1937-38 patterns of breastfeeding had not altered much; at 3 months, 81% of infants were being breastfed. Further studies in 1963-64, however, suggest that a change had occurred; at 3 months, only 24% of mothers studied were still at least partially breastfeeding. Similar trends are reported for Hungary in the period 1960-69, more marked in Budapest however than in rural areas.

In the USA, analysis of infant feeding practices by birth cohort shows that two out of three mothers born before 1920 breastfed their first child. Of the cohorts born in 1936-40 and 1941-45, however, only about 1 in 3 breastfed the first child.

The best documented changes have been those that took place in Sweden between 1944 and 1972. In 1944, 85% of mothers in Stockholm were wholly breastfeeding at 2 months; and, in 1953, 74%. By 1960, the figure for the country as a whole had fallen to 65%; in 1965, to 54%; and, in 1970, to 35%. It is interesting to note, however, that the WHO Collaborative Study, which included Sweden, reports that 93% of the mothers studied in 1976 began breastfeeding, and at 4 months about 50% were still breastfeeding, although with regular food supplements.

This trend towards longer breastfeeding is due to a number of factors, but it is worth noting that considerable efforts have been made in Sweden to encourage breastfeeding through health services, general education of the public and supportive measures to mothers.

Trends in developing countries

The decline observed in developed countries has also taken place in certain parts of the developing world, although the changes have shown distinct regional and socioeconomic differences. In 1966, 30% of 300 infants born in a major hospital in San Carlos, Costa Rica, had been weaned by the 15th day; in rural areas of Costa Rica, at the same time, 60% of infants were still breastfed at 6 months and 28% at one year. Recent reports for urban Costa Rica indicate no significant change since 1966.

In Brazil, 1976 data from Campinas indicate that 17% of the 855 primiparae studied did not start to breastfeed, and that, of those who did, 50% had weaned their babies by 2-1/2 months.

In Uruguay, in 1946, the average duration of breastfeeding among low-income mothers was estimated to be 5 months; in 1949, 4 months; and in 1977, less than 2 months. Recent data for Argentina indicate that, in some places, up to 80% of infants were weaned by 3 months.

A national survey in Ghana, in 1962, again illustrates the regional character of infant-feeding practices, and especially the differences between the north and south of the country. In the north, 88% of infants were being wholly breastfed at 6 months, and in the south, 51%. Proportions varied also with degree of urbanization.

In the Philippines in 1955, 90% of babies born in low-income parts of Manila were still being breastfed at 12 months, but by 1964 the proportion had fallen to 50%. Data for the Philippines show that the decline was much more pronounced in the cities than in rural communities. The results of the WHO Collaborative Study for the Philippines confirm these urban/rural differences; they indicate also that the decline in breastfeeding has continued. In the cities 32% of the well-to-do mothers who were interviewed in 1976-77 had never breastfed the youngest child. Similarly, almost 15% of urban poor mothers, but only 6% of rural mothers, had never breastfed.

Many of the studies cited above used different methods. Although they show relatively consistent trends, it is often difficult to compare studies because population study groups have been differently selected, and the ages of the infants studied have varied, as have the research issues.

The WHO Collaborative Study

To define the current state of breastfeeding more clearly and to identify the factors contributing to change, WHO has set up a collaborative study that took place from 1976 to 1978.* Nine countries were selected to provide a broad regional and cultural representation and examples of different levels of socioeconomic development: Chile, Ethiopia, Guatemala, Hungary, India, Nigeria, the Philippines, Sweden and Zaire. In each country mothers were selected from urban well-to-do and urban poor backgrounds, and from rural traditional areas. In all, about 23 000 mother/child pairs, with infants under 2 years of age, were included.

The results of the study corroborate the findings of previous reports. Thus, there were marked urban/rural differences in patterns of breastfeeding in most of the countries; mothers in cities were less likely to breastfeed than rural mothers, or to breastfeed for as long as rural mothers. In most of the countries the prevalence and duration of breastfeeding were inversely related to the mothers' socioeconomic background. Sweden was a notable exception. In the Philippines, where the lowest prevalence of breastfeeding was documented, 32% of urban well-to-do mothers had not breastfed the youngest child; in Guatemala, the corresponding percentages were 23% among the urban well-to-do and 9% among urban poor mothers.

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* World Health Organization. Contemporary patterns of breastfeeding. Geneva, WHO, 1981.

Breastfeeding was more common, and practised longer, in rural areas than in urban communities in all the developing countries participating in the study. This supports the hypothesis that breastfeeding is made more difficult by many of the demands of modern society, especially urban society. It is particularly interesting, therefore, that the general prevalence of breastfeeding in Hungary and Sweden, both developed countries, was appreciably higher than for certain population groups in developing countries. In Nigeria, Zaire and India, breastfeeding was virtually universal.

Factors affecting trends in breastfeeding

The findings of the WHO Collaborative Study tend to disprove the hypothesis that the decline of breastfeeding is a necessary result of modernization. In Hungary and Sweden, the data show that previously reported downward trends have been reversed. Similar findings have been reported in England and other European countries, as well as in Australia and Canada.

It is also interesting that whereas in developing countries the more educated mothers are the least disposed to breastfeed, the reverse is often the case in developed countries, where breastfeeding is now common among the more educated. Historically, the decline in breastfeeding in Europe and North America occurred first among upper-income-class mothers; they appeared to act as role models to other mothers. If this is so, and if these groups set trends, it may be anticipated that the trend towards more breastfeeding in developed countries will gradually be taken up by all social classes.

As for the duration of breastfeeding, the mothers who breastfeed the longest are still those in developing countries, especially in the rural areas. The data from the WHO study, for example, indicate that in many rural traditional communities mothers may breastfeed for 18-24 months. Previous studies in India and the Republic of Korea have reported similar findings.

The WHO study indicates that a number of factors may be affecting patterns of infant feeding. The policies and practices of health services, particularly those relating to prenatal and maternity care, are of crucial importance in encouraging breastfeeding. In many of the countries studied, breastfeeding - both initiation and duration - was found to be positively associated with effective policies for rooming the mother and infant together in hospitals, and initiating breastfeeding in the first 12 hours. In most countries there seemed to be no no consistent policies for whether the mother and the infant are roomed together, or the time of the first breastfeed; they are often left to the discretion of individual clinicians and hospitals. Also, few of the prenatal services reviewed provided mothers with early systematic information about, or encouragement for, breastfeeding.

In developing countries, many mothers have little if any access to the type of support that maternity leave and maternity benefits provide; similarly, very few countries provide crèches and breastfeeding breaks for working mothers.

The influence of commercial interests has been widespread: The WHO study noted that in some developing countries where the prevalence and duration of breastfeeding were low, there was also intense marketing of breast-milk substitutes. However, in view of the number of factors involved in this situation it is very difficult to show a direct relationship. In some countries information about commercial products was sometimes provided within and through the health services, whether through printed material, direct contact with representatives of commercial concerns, or the distribution of free samples.

Reasons given by mothers for not breastfeeding, or for terminating breastfeeding early, show a widespread lack of knowledge about lactation as a physiological process and about the capacity of most healthy mothers to lactate successfully and to produce enough milk for their infants.

Whether breastfeeding will continue to decline in the developing world as it appears to have done until recently in developed countries will depend on what is done to support and promote it. Without more education and systems of support of mothers during pregnancy and maternity, the decline is likely to continue. However, if support systems are developed, and if negative social influences can be controlled, the decline observed so far might be halted and possibly reversed.

2.4 SUPPLEMENTATION AND WEANING

Weaning is a process by which foods other than breast milk are introduced gradually into the baby's diet, first to complement breast milk and progressively to replace it and adapt the child to the adult diet. Weaning is therefore an important period of adaptation from breast milk, which satisfies all the nutritional needs of the infant for the first few months, to a mixed diet containing solid foods. Weaning practices, like breastfeeding, are vulnerable to social pressures. Urbanization and industrialization change the demographic structure of society and the physical relation of the people to agricultural land. Foods that can be used in weaning may stop being produced and occasionally it may be necessary to anticipate the need for industrially processed weaning foods.

When does weaning start?

For nutritional reasons, the introduction of other foods to a wholly breastfed infant may become necessary between the fourth and the sixth month. By that time, breast milk may become insufficient to satisfy the infant's needs. Supplementary foods contribute by providing the energy, proteins, vitamins and minerals that the growing child needs. The exact time that weaning should begin is determined by the lactation performance of the mother and the rate of growth and maturation of the infant; it does not therefore depend strictly on age, but for most infants it is between the ages of 4 and 6 months.

It is now accepted that there are no nutritional advantages in very early introduction of supplementary foods; they may subject the infant to some unnecessary risks, e.g., food intolerance or a tendency to overeat. Foods other than breast milk may be carriers of infections; this risk is high for people living in unhygienic and unsanitary conditions. Under such conditions the epidemiological entity of "weanling diarrhoea" is well known. Nevertheless, to ensure continued good nutrition, weaning must usually begin not later than the age of 6 months. The late initiation of weaning may lead to malnutrition. This is apparent in data from the WHO Collaborative Study, which show that with low rates of supplementation after the age of 6 months, e.g., among the urban poor and the rural population of India, the rate of growth of infants slowed down to well below the norm for this age.

The late initiation of weaning was particularly noticeable among the urban poor in India and Ethiopia, where 40% and 15% of infants respectively were still exclusively breastfed at 12 and 13 months; in rural India the proportion was 36%. At 18 months, among the urban poor, 12% of infants in Ethiopia and 20% of infants in India were still not being weaned. Among the urban well-to-do, almost all infants everywhere were receiving regular supplementation at 6 to 7 months of age.

When does weaning end?

The time by which a child can be safely weaned completely, terminating breastfeeding, depends on the nature of the weaning diet. If the child can be fed with milk or milk products in a varied diet, which usually also includes other animal foods, weaning can be completed early, before one year of age. On the other hand, if the child when completely weaned is going to be fed on a diet based on cereals or starchy roots or fruits, with very little or no animal products, continued breastfeeding helps to maintain its health until the age when its nutritional requirements can be more easily met with the foods usually taken by the adults in the family.

Weaning is thus a gradual process during which breast milk is progressively replaced by a mixed diet. It is a process of adaptation, not only nutritionally but also socially, the child becoming less dependent on its mother. It is also a process of adaptation to the environment. Abrupt weaning, as practised in some cultures is therefore dangerous; the younger the infant, the greater the danger.

Patterns of weaning vary considerably, depending on both sociocultural and economic circumstances; for example, in some cultures a child is normally breastfed until the mother's next pregnancy.

When an infant is weaned from the breast to breast-milk substitutes, weaning is usually completed earlier than when the infant is weaned to a diet consisting mainly of cereals or vegetables. The WHO Collaborative Study was able to identify three fairly distinct patterns of weaning. The first was a steep fall in the prevalence of breastfeeding with the age of the infant, so that by 6 months over 50% of the infants in all population groups had been completely weaned. This pattern was found in all the economically well-off groups, except in Zaire and India; it also included the groups from the two developed countries covered by the study.

At the other extreme, with the third type of weaning pattern only about 10% of infants were completely weaned at 6 months; at 12 months, the proportion was still less than 25%; even at 18 months, more than 65% of infants were still being breastfed. The groups following this pattern included the rural and urban poor of Africa and India.

The intermediate pattern was a linear fall in the prevalence of breastfeeding with the age of the infant, with about half the infants weaned by 12 months.

Cultural influences were apparent in three groups that behaved atypically as compared with other groups of the same socioeconomic status, namely the well-to-do of India and Zaire, where weaning took place later, and the urban poor of Chile, who weaned their infants earlier.

Weaning foods

At the time infants begin to need foods other than breast milk to satisfy their nutritional needs, they are not yet ready physiologically for an adult diet; their stomach is still small and they cannot chew. Their food must therefore be adapted accordingly. In some cultures, food is specially prepared for the child being weaned but in others it is taken from the family's food. What is given is not always to the infant's advantage; soft bland food selected for its consistency may not be nutritionally adequate, and more nourishing food may be withheld because it cannot be properly prepared or is considered unsuitable. What is given is considered best for the child; good food is not withheld, as is sometimes interpreted, in favour of other members of the family.

As with the timing of weaning, the types of food given to the weanling reflect both cultural and economic differences. The WHO Collaborative Study showed that in Sweden, for example, vegetables were added to the diets of almost all infants from three months onwards; cereals were added from the age of six months; animal proteins and legumes were being given to approximately 40% of infants between three and six months.

In India, on the other hand, the introduction of cereals during the first six months was relatively rare although by the end of the first year most of the infants who were being supplemented were receiving cereals.

There was little evidence of any foods other than cereal and milk or milk products being introduced during the first six months. Among the rural population, legumes were widely used after six months, and by the end of the first year were being given to most infants who were receiving supplements. This was rare in the towns. The use of vegetables was generally very limited, particularly among the urban poor, where at all ages less than 25% of infants were receiving them.

In the well-to-do groups vegetables were being given to nearly all the infants by the end of their first year. Patterns in the other countries studied mostly fell somewhere between those found in Sweden and in India. Weaning practices clearly vary considerably between countries.

From the nutritional point of view, and in view of the infant's limited gastric capacity, the concentration of energy and nutrient is an important characteristic of weaning foods, particularly as the child grows older and a progressively greater proportion of energy and nutrient needs is met by weaning foods rather than by breast milk. A small child needs more frequent feeds than older children and adults. A soft, almost semi-liquid, consistency is needed at the beginning; it is progressively changed as the child is able to deal with more solid foods. By the timely introduction of foods with adequate consistency to stimulate the chewing reflex the child learns to chew and this facilitates proper feeding later.

In developed countries, a large variety of industrially produced weaning foods are now available and widely used. They consist of cereal-based products as well as vegetables, fruit and mixed vegetable-and-animal products. They are usually precooked and ready to eat, and like breast-milk substitutes are "convenience foods" for busy mothers. The introduction of such products in developing countries must be viewed with caution. They often replace local and equally nutritious foods, and are more costly. In addition to the drain on family income, their high cost may mean that infants are not given adequate quantities. Even in developed countries the greater variety in taste and consistency of home-prepared weaning foods makes an important contribution to the infant's introduction to a varied adult diet.

In developing countries, nutritionally adequate weaning foods may sometimes be scarce or too expensive for sections of the population, particularly low-income urban families. Efforts have accordingly been made to produce by industrial processing at the local level, nutritionally adequate low-cost weaning mixtures. They are usually based on vegetable products properly combined and processed, and enriched with vitamins and minerals; in some cases they may contain animal products. A few have been successful but many have failed, mainly for economic reasons.

Problems of weaning

The main risks associated with weaning, particularly in developing countries, are malnutrition and infection. Infants go from breast milk, which is nutritionally ideal and sterile, and may protect against infections, to a diet that may be nutritionally poor or contaminated or both. Bottles and teats which may be used during the weaning period are difficult to sterilize, especially where fuel, water and time are scarce. The fact that the bottle facilitates the provision of any fluid, also means that there is an increased risk of infants being given foods that are not suitable or do not help to meet their nutritional needs. The level of risk associated with bottle and breast-milk substitute feeding is related to socioeconomic background, level of education and the physical environment.

By the age of weaning, infants have lost the passive immunity transmitted from the mother, and as they begin to move about they are increasingly exposed to the environment. Besides "weanling diarrhoea", other common infections and infestations occur that act synergistically with malnutrition to bring about the very high morbidity and mortality observed during the weaning period in developing countries.

In developed countries also, the weaning period may see the beginning of poor dietary habits, such as high-energy, high-fat, high-protein, high-sodium and low-fibre intakes, which may be related to some of the more common health problems of later life.

Breastfeeding exclusively for the first few months, timely and adequate supplementation, and maintaining breastfeeding long enough to ensure its replacement by a safe and nutritious diet, are therefore extremely important measures to ensure a healthy start in life.

GLOSSARY

Artificial feeding

Infant feeding with milk other than breastmilk.

Breast-milk substitutes

Any food that is used to replace breastmilk. In addition to products specifically designed to this end, e.g., Infant formula (see below), the term also refers to other preparations which were not intended to replace breastmilk and are thus used inappropriately.

Immuglobulins

Specific proteins that take part in the anti-infective mechanisms of the body.

Infant

The child under one year of age.

Infant formula

A breast-milk substitute formulated industrially in accordance with applicable Codex Alimentarius standards, to satisfy the normal nutritional requirements of infants up to between four and six months of age, and adapted to their physiological characteristics.

Joule

The joule has replaced the thermochemical calorie as the unit of energy in the S.I. system.

1 KJ = 0.239
1 MJ = 239 kcal

Supplementary foods, weaning foods

Foods given to the infant in addition to breastmilk to meet its nutritional needs during weaning. This definition covers a wide range of foods and food preparations, from porridge or gruel made from local foods in the home to manufactured infant foods.